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Articles appearing in this series are abstracted and indexed in *Historical Abstracts* and/or *America: History and Life.*

5 **A History of Martello Towers in the Defence of British North America, 1796-1871,**
by Ivan J. Saunders

171 **Report of the 1972 Archaeological Excavations of the Market Shoal Tower, Kingston, Ontario,**
by Donald A. Harris

Canadian Historic Sites: Occasional Papers in Archaeology and History/Lieux historiques canadiens: Cahiers d'archéologie et d'histoire – No. 15

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A History of Martello Towers in the Defence of British North America, 1796-1871

by Ivan J. Saunders

Canadian Historic Sites/
Lieux historiques canadiens
No. 15

6 **Abstract**
6 **Sommaire**
8 **Introduction**
9 **Historical Background**
17 **The Era of Great Construction 1796-1815**
20 Prince of Wales Tower
23 Fort Clarence Tower
25 York Redoubt Tower
27 Quebec Martello Towers
34 Georges Island Tower
35 Carleton Martello Tower
37 Sherbrooke Tower
40 **Stasis and Neglect: 1815-45**
52 **The Construction and Arming of the Kingston Towers: 1845-63**
65 Branch Ditch Towers
66 Murney Tower
68 Fort Frederick Tower
69 Cedar Island Tower
70 Shoal Tower
74 **Decline and Obsolescence, 1846-71**
87 **Conclusions**
92 **Appendix A. Prince of Wales Tower, Halifax**
98 **Appendix B. Duke of Clarence's Tower (Fort Clarence Tower), Halifax**
100 **Appendix C. Duke of York's Tower (York Redoubt Tower), Halifax**
103 **Appendix D. Georges Island Tower, Halifax**
105 **Appendix E. Sherbrooke Tower, Halifax**
107 **Appendix F. Carleton Tower, Saint John, N.B.**
110 **Appendix G. Tower No. 1, Quebec City**
111 **Appendix H. Tower No. 4, Quebec City**
113 **Appendix I. Tower No. 2, Quebec City**
117 **Appendix J. Tower No. 3, Quebec City**
118 **Appendix K. East and West Branch Ditch Towers, Kingston**
123 **Appendix L. Murney Tower, Kingston**
130 **Appendix M. Fort Frederick Tower, Kingston**
141 **Appendix N. Cedar Island Tower, Kingston**
148 **Appendix O. Shoal Tower, Kingston**
156 **Endnotes**
166 **Bibliography**

Abstract

Martello towers were a distinctive and popular form of light permanent artillery defence in British North America from 1796 to 1846, where sixteen of them were built in that time. After 1848 their value diminished in the face of a variety of changing political and technological conditions until they were finally rendered obsolete by major advances in ordnance technology in the 1860s. This type of tower originated largely by accident, but it quickly found a wide and enduring acceptance in British North America because it met a great variety of political, military and economic needs. Martello towers often offered the only practical means of beginning or augmenting the permanent defences of important colonial centres. Throughout the whole era of the construction of masonry fortifications in British North America, Martello towers were a substitute for larger and more desirable but financially impracticable works of defence.

Submitted for publication 1972
by Ivan J. Saunders,
National Historic Parks and Sites
Branch, Ottawa

Sommaire

Les tours Martello sont de petites fortifications permanentes caractéristiques, circulaires, construites en briques ou en pierres. Elles étaient conçues pour repousser les attaques de l'infanterie et résister dans une certaine mesure au feu d'artillerie. Leur objectif essentiel était la défense des côtes. Elles ont connu une grande popularité chez les Britanniques au début du XIX^e siècle et, dès 1815, ils en avaient construit un grand nombre en Grande-Bretagne et dans l'Empire britannique.

C'est à cette même époque que la construction de dix de ces ouvrages a été entreprise en Amérique du Nord britannique et, une fois la paix revenue elles sont restées l'un des moyens classiques du système de défense des colonies. Bien que les responsables de la défense du Canada aient recommandé la construction de dizaines de ces tours après 1815, on n'en érigea plus que six (à Kingston, de 1846 à 1848). L'utilité permanente des tours Martello durant cette longue période reflète à la fois la stagnation du progrès de l'artillerie et les efforts désespérés déployés par les Britanniques pour mettre au point une stratégie efficace de défense de l'Amérique du Nord britannique. Leur stratégie, et donc les tours, se sont trouvées dépassées lorsque l'art de la guerre a fait des progrès techniques marqués, en même temps que s'accroissait considérablement la puissance militaire américaine à partir des années 1860.

Depuis des siècles, les tours de pierre avaient constitué un des éléments familiers de la défense côtière en Méditerranée. Les Britanniques eux-mêmes en avaient construites pour défendre les îles de la Manche pendant la révolution américaine, même s'ils ne leur attribuaient pas un rôle militaire essentiel. Ces tours circulaires en pierres avaient acquis leurs lettres de noblesse aux yeux des Anglais dès 1794 lorsque l'une de ces fortifications, la tour du cap Martello, en Corse, repoussa victorieusement l'attaque de deux vaisseaux de guerre britannique, ce qui avait fortement surpris ces derniers. Dès 1796, le Génie en construisit de semblables à Halifax et dans la colonie du Cap. A partir de 1804, face à la menace d'une invasion napoléonienne, les tours Martello devinrent un élément de la défense de la Grande-Bretagne elle-même, et plusieurs de ces tours furent érigées le long des côtes des îles britanniques entre 1805 et 1812.

Leur acceptation générale en Angleterre en a relancé l'usage en Amérique du Nord britannique. Dès avant 1815, sept autres tours disséminées dans les colonies d'Amérique du Nord se sont ajoutées à celles d'Halifax qui dataient toutes trois d'avant 1800, en même temps que les militaires en demandaient la construction de plusieurs autres. Les ingénieurs militaires des colonies ont accepté d'emblée les tours Martello parce qu'elles étaient faciles à construire, peu onéreuses et durables. Elles contrastaient avantageusement avec les blockhaus de bois et les retranchements en terre. Les tours de l'Amérique du

Nord britannique postérieures à 1800 étaient semblables, dans l'ensemble, à celles qui avaient été construite en Grande-Bretagne, mais leur emploi tactique dans les colonies était plus varié. Dans les colonies, les commandants en chef et le génie étaient souvent obligés de se contenter de ces tours moins onéreuses que d'autres ouvrages défensifs militairement meilleurs. Sur le plan politique et militaire, elles ont cependant satisfait à un besoin très réel en Amérique du Nord pendant plus d'un demi-siècle.

Les tours Martello matérialisent les premiers efforts des Britanniques pour établir en Amérique du Nord des fortifications permanentes en maçonnerie. Les trois premières, construites à Halifax entre 1796 et 1799, ont précédé les modèles acceptés en Angleterre. Elles avaient été conçues sur place et ne répondent que de fort loin aux normes ultérieurement fixées pour les ouvrages. Les sept autres tours canadiennes qui ont suivi avant 1815, correspondaient aux critères britanniques officiels bien que certaines d'entre elles, destinées à la défense terrestre, rompent avec la tradition anglaise de défense des côtes. Quatre d'entre elles furent érigées à Québec entre 1808 et 1812, la construction de deux autres commença à Halifax entre 1812 et 1814, et la dernière a été terminée en 1815 à Saint-Jean du Nouveau-Brunswick.

Les trois premières tours canadiennes ont été construites pour contrer les attaques françaises alors que les sept autres avaient pour but de faire face à la nouvelle menace américaine. La montée de cette dernière a constitué l'élément dominant de la stratégie britannique et des mesures défensives adoptées sur notre continent jusqu'aux années 1860. Les tours Martello ont alors constitué l'une des composantes permanentes de l'attitude défensive des Britanniques.

Dès la fin de la guerre de 1812, ces derniers ont cherché à éviter que ne se reproduise le quasi-désastre qu'ils ont subi lors de cette guerre. Toutes les suggestions d'établissement de fortifications pendant la décennie suivante ont abouti en 1825 à la formulation d'un plan de défense global qui suggérait l'emploi des tours Martello comme appoint d'un système de grandes forteresses. On leur accorda encore plus d'importance au début des années quarante lorsqu'il fut clair que la stratégie britannique s'avérait un échec coûteux face à la puissance toujours montante des Etats-Unis et que, par conséquent, la Grande-Bretagne devrait se rabattre en cas de guerre sur sa stratégie nord-américaine traditionnelle de mise en place de mesures d'urgence, avec emploi de troupes mobiles et de retranchements en terre. La construction de nouvelles tours Martello a été stimulée par leur faible coût, et leur souplesse d'emploi, en même temps que par leur rusticité nécessitant beaucoup moins d'entretien que les autres constructions de 1812.

De 1840 à 1847, les responsables de la défense ont recommandé qu'on les emploie pour la protection de plusieurs localités, de St. John's (Terre-Neuve) jusqu'au lac Erié. De 1846 à 1848, on en a construit six à Kingston, en Ontario, ce qui portait à dix-sept le nombre de tours Martello érigées au Canada ; elles ont toutes été utilisées à des fins militaires jusque dans les années soixante.

Les tours de Kingston sont une conséquence directe de la crise de l'Orégon de 1845-1846 ; elles comptent parmi les dernières fortifications permanentes que les Britanniques aient mises en place à l'intérieur de l'Amérique du Nord britannique. Les quatre plus grandes d'entre elles étaient, les plus facilement défendables des ouvrages de ce type existant au monde mais, militaire, elles n'ont jamais eu que peu de valeur. Les considérations d'ordre militaire ayant été subordonnées aux facteurs politiques et économiques lors de leur construction, elles n'ont été complètement armées que lorsqu'elles étaient déjà dépassées.

Les tours Martello de Kingston sont intéressantes surtout de par leur caractère architectural avancé et complexe qui témoigne bien du très grand potentiel de défense de ce type de fortifications.

La leçon de la «crise de l'Orégon» a mis un terme aux projets britanniques de fortifier l'intérieur de l'Amérique du Nord britannique. A partir de ce moment et jusqu'à la retraite définitive des Britanniques en 1871, les tours Martello, aux Maritimes comme dans les deux Canada, ont perdu toute valeur comme ouvrages défensifs armés.

On leur a d'abord progressivement attribué un rôle secondaire dans le cadre des nouveaux plans de défense des années 1850 et du début des années 1860. L'apparition du canon rayé les a frappées d'obsolescence en 1864 en modifiant totalement les impératifs régissant les dispositifs de défense fixe contre l'artillerie. Bien que n'appartenant plus qu'au passé, certaines tours ont été employées à des fins militaires de second ordre jusqu'à une époque avancée du vingtième siècle.

Les onze tours Martello encore en existence restent des témoins patients des fluctuations politiques et militaires qui ont si souvent marqué pendant 75 ans les efforts déployés par l'Angleterre pour défendre l'Amérique du Nord britannique de 1796 à 1871.

Introduction

This report is an examination of the military history of Martello towers in British North America between the years 1796 and 1871. It combines a structural analysis and narrative history of the completed towers with an exploration of the defensive milieu in which Martello towers were an accepted form of fortification and in which they enjoyed such an enduring popularity.

This study was originally intended to be a comparative history of the surviving Canadian towers, with a particular emphasis on those in the possession of the National Historic Parks and Sites Branch. Something of this emphasis has survived into the final product, but it quickly became evident that such a confined outlook offered an unsatisfactory perspective for research. Viewed in such a limited context, the extant towers became military anomalies erected "for the sole purpose of puzzling posterity." Consequently, to make them fully explicable, it was necessary to expand the parameters of the study to include the other towers proposed for British North America, and to attempt to fit all of them into the emergent British fortification and defence policies of the era.

The great breadth of the defence field has rendered all but a cursory and selective examination of it impossible here. It has been necessary to restrict this study to the important points in the development and use of Martello towers. This necessarily limited viewpoint may, in some instances, have produced an overweighted view of the towers' overall importance, though on balance it would appear that they were of more importance than is evidenced by the mere historical footnotes accorded them by most military writers. Even a superficial examination of defence and contemporary fortification policy indicates that in British North America, Martello towers played a definite and substantial role in the development of permanent military works for the colonies. Equally clearly, they were a constant component of all proposed general defensive systems for fifty years.

There was little of direct value on this subject in the published secondary literature. The necessity for detail forced an almost exclusive reliance on primary sources. Consequently, the thoroughness of the report suffers to an extent from the unavailability of many of those sources in Canada. Most of the major policy documents are readily available, but the materials necessary for a close comparison of the British North American towers with contemporary developments throughout the British Empire are lacking. Within the bounds imposed by time and available source materials, this report attempts to provide the fullest possible explanation of the inception, evolution, and persistent and varied use of the Martello towers erected in British North America.

Historical Background

The appellation "Martello tower" is correctly used to describe some 200 thick-walled, round, stone or brick, permanent defensive works erected in many parts of the British Isles, at the Cape Colony, and in British North America and the United States between the years 1796 and 1850. All had the common distinguishing features of a squat appearance, flat roof, a high scarp wall and limited means of entry, although their adaptation to meet a wide variety of defensive needs produced a great variety of structural detail. Most of these Martello towers were constructed in Great Britain between 1805 and 1812 to resist a threatened Napoleonic invasion, and both the name and common appearance of these works were popularized by those erected along the south coast of England. Martello towers were the most popular and enduring type of work in this era of British imperial fortification.

The Martello towers constructed in British North America between 1796 and 1848 displayed few functional differences, although individually they were marked by a profusion of detail adapting them to the local circumstances of their construction and to the peculiar military demands of the times. The sixteen Canadian towers were constructed at four principal British American strategic points: five at Halifax; one at Saint John, New-Brunswick; four at Quebec City; and six at Kingston. The first of them were begun or completed before the end of the Napoleonic Wars in 1815. The six at Kingston, much more complex in design, were constructed in 1846-48 in the wake of the Oregon crisis. None of the towers was ever subjected to attack, and of the sixteen, eleven remain today in testament to the durability, if not necessarily the military efficiency, of the design.

Although most of the Canadian towers are directly derived from the design of towers erected along the south and east coast of England between 1805 and 1808 or from the standardized towers accepted into British fortification theory after 1815, the antecedents of the original design and, in fact, the origin of the name "Martello" itself are matters of some conjecture. This whole issue is of special importance in the Canadian context as three of the British North American towers located in Halifax predate by several years the name or even the specific concept of the Martello towers erected in England to resist Napoleon.

Strictly speaking, the name "Martello tower" applies to the ovoid or circular brick coast defence towers erected in the British Isles in the Napoleonic era. The name itself was first popularized in that context in England after 1803, and was derived from a stone tower on Cape Mortella in Corsica which was valiantly defended against English naval attack in the years 1793-94.[1] In the first instance the name referred to a quite specific design, but it has been corrupted subsequently to include many types of masonry tower fortification. This is particularly true in 20th-century literature, where the term has degenerated into a convenient, if often misapplied, descriptive catch-phrase.

The characteristic English Martello tower was a circular masonry structure two storeys high, with a terreplein on top designed to take from one to four guns. It varied in exterior top diameter from 35 to 55 ft., depending on the number of guns to be mounted, and was from 30 to 35 ft. in height. It had a bombproof arch above its second storey covered in masonry to the level of the terreplein and sustained at the centre by a masonry pillar. The platform was surmounted on its periphery by a parapet some 6 ft. in height with a banquette step all round. The upper interior storey was fitted as a barrack floor and the lower contained a magazine and storage facilities. The characteristic entry to the tower was by a door in the upper storey, reached by a moveable ladder or drawbridge.[2] In essence these English towers were elevated gun platforms, high enough to make escalade difficult, and capable of independently housing and defending their garrisons against all but a sustained regular attack assisted by artillery. All of the Canadian towers fall within this functional definition, and all but the first three Halifax towers are structurally compatible with it.

While the name "Martello" can be traced satisfactorily to a Corsican origin, the same is by no means true of the design. It appears, in fact, that the Italian Mortella tower was a weak and primitive structure distinguished more by circumstance than any intrinsic merits of its construction. In the English context, at least, it appears to have done little more than popularize the general virtues of towers within the military establishment, as the important engineer officers at its siege were not directly involved in the design of the English towers and some retained reservations about their use. A much more convincing case for the antecedents of the English Martello towers can be made by considering the construction of a number of basically similar towers on Minorca which the English occupied in the years 1798-1801,[3] and by the impetus provided by the French invasion scare of 1803-05 to find some cheap, functional and reassuring means among the possibilities then available of defending the threatened coasts. This may explain the development of the English towers, but it by no means elucidates the origin of the Minorca towers of 1798, or, more importantly, the genesis of the first towers that were begun at Halifax or Cape Colony in 1796.

There are no readily attributable English precursors for such towers. Masonry towers as outworks, and more particularly as adjuncts to major fortifications were a normal feature of medieval fortification in northern Europe, but with the increase in the power of artillery they fell into disuse. A distant relative of the early 19th century towers can, perhaps, be discerned in the coastal defences erected by Henry VIII after 1538, in fear of an invasion inspired by the papacy. They were the most extensive coastal works erected in England before the 19th century, and featured isolated castles with round stone towers as keeps.[4] The proportions and function of these towers, however, cannot be equated with those of the 19th century towers, and they cannot be said to provide any direct link. The paucity of towers in English artillery fortification is indicated by the fact that one must look forward to the period of the American Revolution for the next instance of their use.

At that time, in fear of a French naval attack, it was proposed to build 30 round coastal defence towers on the exposed Channel Island of Jersey. Construction began in 1779, and 20 had been completed at the time of the Cape Mortello incident in 1794. All were respectable stone works, although lacking some of the characteristic features of Martello towers. They were followed after 1783 by the construction of 15 small and inferior battery support towers on the nearby Island of Guernsey. They were better adapted to guard duty than to providing any real measure of military defence, as each was only 20 feet in diameter with four-foot-thick walls. They were intended to be equipped with Coehorn ordnance, but were never armed. After the war, in 1787, they were examined in detail by a committee of engineers who concluded that:

In consequence of their circular figure and smallness of their diameter, the fire from the Crénaux, or even from the top is very inconsiderable . . . for the security of the lesser batteries, we approve of towers, but would recommend a different construction.[5]

Although it is evident from the above and other circumstantial evidence that there were within the Corps of Royal Engineers supporters of and even enthusiasts for the use of towers as detached works, it is equally certain that no single satisfactory design had been settled on.[6]

As the Channel Island towers were the only similar works erected in the British Isles before the enthusiastic spate of tower building that scattered well over a hundred such structures along the British coasts between 1804 and 1812, we must seek elsewhere for their direct precursors. Contemporary North European influences are difficult to discern and a more fruitful source of inquiry devolves on southern Europe. There, in the Mediterranean and Black Sea areas, particularly in the areas under Genoese influence where different conditions of warfare prevailed, isolated stone towers were a common means of defending the sea coast against marauding pirates and privateers:

The flat shores of the Roman Campagna had been defended in this manner since the fifteenth and sixteenth centuries: there were similar towers in Minorca; and in Corsica there were 85 such towers built at varying periods on prominent points overlooking the sea.[7]

It was certainly one of the latter towers that was defended so spectacularly by the French in 1794. It appears likely that the pre-existing Minorcan towers, in part at least, inspired Captain Robert D'Arcy of the Royal Engineers to undertake his building programme there in 1798.[8] Little is known of the origins of these towers and, bereft as the above descriptions are of structural detail, it is impossible to trace in them an evolutionary trend leading to the established pattern of the British gun towers as drawn up by Colonel Twiss and Captain Ford in 1803.

Thus the specific origins of the three towers erected at Halifax in 1796-98 under the direction of Prince Edward, the Duke of Kent, are a matter of conjecture. They may well have owed their inspiration to the Corsican towers, but in their essentially similar design and some of their more salient structural features, they appear to diverge both from what is known of the Mediterranean towers and from some of the immediate influences that went into the early English type. Their pattern may have been derived either from some general or specific body of knowledge extant in the engineer corps before 1796 or from some particular and as yet unascertained progenitor. Whatever the origin of these early towers, it seems fairly certain that the knowledge passed to Halifax in well-developed form under the aegis of Captain Straton, Edward's Commanding Royal Engineer. Edward credited Straton with the proposal for the Prince of Wales Tower on Point Pleasant and the short interval between its suggestion and commencement, a mere two months, suggests that little local initiative was required in its planning.[9]

Any cursory examination of the source materials relating to the origins of Martello towers generally, or the early Halifax towers in particular, is not very enlightening for, as one student of the subject notes: *Towers, armed with cannon at top, have always been considered a good expedient for the defence of a coast, and have been built of various shapes and sizes, in different countries and situations.*[10] Nonetheless, a perusal of such material as is available is made worthwhile by the information it provides on the development of the prototype English towers.

S.G.P. Ward, in his careful study of this developmental process, *Defence Works in Britain 1803-1805*, clearly attaches great importance to the Minorcan towers which in turn, as has been illustrated, must have been influenced by the presence of the older patterns of Mediterranean towers. Captain D'Arcy, the engineer officer in Minorca while the British held the island in the years 1798-1801, superintended the construction of 15 cannon-armed stone towers during that period. D'Arcy himself was a firm believer in towers as detached works and his efforts could hardly have failed to make an impression on his professional peers. The largest of these Minorcan towers *were 55 feet in exterior diameter at top, their exterior height being 36 feet with a slope of 1-12th. The thickness of the parapet was 12 feet all round; its height 6 feet; and its dip 2 feet 6 inches. The height of the lower storey of the towers was 11 feet: over which was a wooden floor covered with paving tiles . . . the height of the upper storey measuring to the crown of the arch was 15 feet 6 inches. The bombproof arch was a dome of a section nearly elliptical, the span of which was 31 feet, and its rise 11 feet 8 inches. The dome and exterior outline of the tower were described from the same common center. The thickness of masonry over the crown of the dome was 5 feet.*

Above the principal entrance, which . . . was a door placed on the level of the upper apartment, there was a machicooly [machicoulis]. *. . . The ascent to the terrace was by a spiral or winding staircase, set in the wall. A hatchway and ladder led to the lower storey, which was partitioned off into three apartments. There was a cistern excavated below the general level.*

A long heavy gun, whose centre of motion was in the rear, was mounted on these towers; but as there was more than sufficient room for one gun, a howitzer or carronade was also added.[11]

The likenesses between these towers and the English Martello towers are startling; in essence the Minorcan towers lack only the central pillar to assist in sustaining the bombproof arch.

There is, however, no evidence to connect either Captain D'Arcy or any of the other Minorcan engineers with the earliest English tower proposal. This was drawn up by Captain W. H. Ford, R. E., and submitted in an undated memorandum through the intermediary of his superior, Colonel William Twiss, R. E., sometime before July 1803. Ford described a two-storey square tower mounting a heavy traversing gun on top. Ford also appears to have made drawings of round towers similar to that on Minorca. Ford joined Abercromby's army in October 1800, serving in Egypt until February 1802. Ward surmises that he was in Minorca where Abercromby's force was assembled in the autumn of 1800 and so would have observed the towers there.[12] Despite his careful development of circumstantial evidence on behalf of Captain Ford, Ward himself balks at definitely ascribing the plan of the English Martello tower to Ford through the medium of the Minorcan tower. He is forced to conclude rather lamely that

> *In viewing the modifications both in design and intended employment through which the Martello Tower passes, we are left only with the conclusions, even taking Ford's contribution and the Minorquin towers into account, that it cannot be said to have had a single "inventor" . . . that though it bore the name of the Corsican tower, the transplanting process to England is invisible: that an immediate connection between it and the towers in Minorca can, on the other hand be established: and that, in any case, towers mounting ordnance were more deeply bedded in Engineer tradition than might have been expected.*[13]

The arrival of the idea in England had an immediate and controversial impact on defence planning. The war with revolutionary France had produced a number of invasion alarms in England. There had been one in 1797-98 and another in 1801, when a vast French force massed at the invasion port of Boulogne. Defensive measures had been under way since 1796 and the Peace of Amiens in 1801 provided a brief respite, but no relief, from the threat. When the war was renewed with imperial France on 24 May 1803, the French forces massed on the Channel were even larger than before. All manner of defensive schemes were brought forward by the various military agencies in the prevailing atmosphere of crisis. Lacking the resources to defend the whole coastline, the military authorities quickly narrowed the likely invasion points down to areas of the south and east coasts. Of these the most severely threatened were those on the Sussex and particularly the Kent coasts.

It was at this critical juncture in the summer of 1803, with the Horse Guards already contemplating massive expenditures along the south coast, that Captain Ford came forth with his tower proposal. He suggested that each of his towers could be erected at a cost of £3,000, would be long enduring, and would require no regular garrison, and, if peace came, their ordnance could be dismounted and the towers shut up to await a renewal of conflict.[14] Ford apparently intended that his towers should be placed at short intervals along the threatened coast and be mutually supporting. Ford's idea was taken up by his superior, Colonel William Twiss, the Commanding Royal Engineer in the southern district, an acknowledged defensive expert who had served in British America as an engineer with Carleton, Burgoyne and Haldimand. Twiss did not favour scattering towers along the whole coast, preferring instead to erect them as adjuncts to existing coast batteries, and his endorsement of Ford's scheme on 22 July 1803 was couched in these terms. A year earlier he himself had endorsed a proposal for a round tower for a redoubt in Ireland.[15]

Twiss's and Ford's 1803 proposal was passed quickly up the army chain of command where it found enthusiastic or conditional support at every turn. The Horse Guards considered fortifications the only sure means of defence[16] and quickly adopted Ford's proposal in its entirety. The Quartermaster General's department had no funds to initiate it, however, and the Secretary of State for War referred the scheme to the Master General of the Ordnance for engineer opinion and approval, as its implementation would be an engineer responsibility. The towers had already received the approval of the commander-in-chief, the Duke of York, who accepted them as a means of extending the existing coast defences because of their cheapness, the impossibility of taking them except after heavy artillery fire, and their capacity for protecting a coast as well as a body of troops could do.[17]

The engineers, however, overwhelmed with work and short of qualified officers, displayed little enthusiasm for the massive building programme and the report of the committee of engineers was not returned until 26 April 1804. This report was signed by Lieutenant General Robert Morse, Inspector General of Fortifications, General Abraham D'Aubant, a prominent engineer officer who had inspected the Guernsey towers in 1787 and witnessed the assault on the Corsican tower in 1794 as second in command of the expedition, and Colonel Twiss.[18] This committee reported sceptically on the proposed building programme:

> *Towers as sea-batteries . . . appear to have little or no advantage over any other battery of the same number of guns. It is admitted that upon first landing of an enemy a tower is not to be taken by assault; but a few shells thrown by small mortars brought on shore . . . might in a short time destroy the carriages of the guns on the platform or top of the tower and thereby render its effect as a sea-battery useless. Therefore after a full investigation of this subject, we do not recommend the erection of towers as sea batteries or to obstruct the landing of an enemy.*

They did, however, recommend circular towers to supplement existing or proposed batteries, and selected 13 sites for these at an estimated cost of £57,000.[19]

This critical assessment was sustained some years later by Lieutenant Colonel Pasley in his textbook on elementary fortification. Referring to the successful engagement of the Corsican tower with two ships of war, he said,

> *This circumstance ought merely to have proved the superiority, which guns on shore, must always in certain situations, possess over those of shipping, no matter whether the former are mounted on a tower or not . . . .* [In the same war] *a common two-gun barbet battery, situated on a commanding cliff on the coast of the Kingdom of Naples, beat off a British 74 gun ship, supported by a frigate . . . a party of seamen and marines were landed with a couple of field pieces, who in a very short time made themselves masters . . . of this insignificant work . . . . The Corsican tower, above mentioned, which had in like manner completely baffled a naval cannonade, was very soon found to surrender, when attacked by land; not, however, before a small battery had been made to reduce it.*[20]

The critical engineer committee report of 1804 should have weighed heavily against the general and extended use of towers as sea batteries but did not. It did not because political pressure was mounting in every quarter for their construction. The Admiralty and the Duke of York favoured towers, and even Pitt, the Prime Minister, was displaying a personal interest in their completion. They had been urged in a House of Commons speech at the end of 1803 and, under the continuing threat of invasion, Twiss, on 12 September 1804, after consultation with the Prime Minister and the Deputy Quartermaster General, recommended the construction of 88 round towers on the south coast at a cost of £221,000. This decision was confirmed at a high-level conference on coastal defence on 21 October, and the final number of towers was set at 86. In the event, 74 of them were constructed between Folkestone and Seaford.[21] Although Ford's original design had been for a square tower, the circular pattern had been settled on by the engineers earlier in October 1804 for reasons of economy, and was confirmed at the conference on 21 October. Definite orders to commence construction were finally issued on 27 December of that year.

The long and involved controversy surrounding the choice of pattern and decision to construct the English Martello towers is worthy of note chiefly because it is so illustrative of the preponderance of political over military considerations whenever or wherever the question of constructing Martello towers arose.

As no Martello tower was ever subjected to attack, any view of their military virtues must remain conjectural, but an analysis of the English controversy, viewed in the light of what later occurred in British North America, must lead one to the inevitable conclusion that this consideration was, for the most part, of quite small consequence. Clearly the engineer corps favoured restricting the use of such towers to positions where they could serve as battery keeps and be afforded some supplementary protection by the main works. On the other hand, the politicians appear to have pressed for their extended construction, under pressure of an attack of "war nerves," because they could be readily and quickly built, made small demands on valuable men and equipment, and because they created the appearance of extensive preparation at minimal expense to the Treasury. These same considerations were to operate later in the construction of the towers at Kingston, Quebec, and other parts of British North America.

The main group of towers on the south coast was not completed until 1808, but once initiated, a craze for coastal tower building swept over the British Isles. Fourteen were built in Ireland in the Dublin area before the end of 1805 and others added later, and three completed in Guernsey at the same time. Twenty-nine towers were constructed on the east coast between 1805 and 1812, and in Jersey a line of towers was erected on the shoreline.[22]

The main group of English towers on the south coast was later acknowledged by the board of ordnance to have cost a total of £223,000, or an average figure very near Ford's first estimate of £3,000 each. All of the British towers were completed in the short space of years before the end of the Napoleonic Wars and the government was not, after 1815, tempted to further construction of them for military purposes at home. In fact their military value was soon cast into some doubt and the first of the towers was disposed of by the Ordnance as early as 1819. Most, however, survived and 27 of those on the south coast remain today.[23] Some of the latter were pressed into service in World War II, as were a number of their Canadian counterparts, being among the most durable of all the 19th century fortifications.

None of the British towers was ever regularly garrisoned, although most were armed and maintained in service until rendered demonstrably obsolete by the introduction of steam war vessels and the great upheavals that characterized armament and coast defence technology in the 1850s and 1860s. From the outset the towers had many critics although they continued to find advocates for years. Among the critics was George Murray, who had participated in their construction and who later, as Master General of the Ordnance had expressed serious doubts as to the worth of their repair. It should be noted, however, that as Murray was questioning the virtue of the towers at home he was acquiescing to the Colonial Secretary's desire for the construction of their counterparts at Kingston, Canada.[24]

In 1844, Colonel Lewis, R. E., a noted chronicler of fortification technology, noted the whim and accident that had determined the use of towers along the English and Irish coasts, but nonetheless suggested the utility of such towers in forming keeps for batteries. He included in his article a number of drawings of types of towers variously used in the British service, and among these were drawings for a three-gun tower which he felt to be best adapted in terms of size and cost to the purposes of sea defence. This tower, ovoid in plan, is obviously derived from the original Martello tower and must have been of an officially accepted pattern, as it is identical with those proposed for Kingston in 1841.[25]

One of the last advocates of the English towers was the Duke of Wellington, who, when consulted about them when a new invasion threatened in 1845, replied,

> *My own opinion is in their favour. At all events, if they are nothing else, each of them is an excellent defensive guard house, which cannot be surprised and may be defended for ever against anything but a regular attack by a superior force.*[26]

Wellington himself nonetheless recognized the efficacy of steam war vessels against such structures and, although the towers are implicitly dismissed rather than frankly condemned in later general assessments of the coast defences, the towers' military usefulness could not have long outlived Wellington's qualified approval of them. Indeed the obsolescence of these towers was so generally recognized by 1860 and they were so superfluous that in August of that year one of them, No. 71 on the Sussex coast, was used as a target and utterly destroyed in a firing trial of the new rifled Armstrong guns.[27] To a large extent the latter-day history of the British towers parallels the North American experience, although in British North America their obsolescence was more slowly recognized, and, due to the general paucity of funds for erecting a modern and extended system of colonial defence, greater efforts were made to adapt the existing structures to the changing conditions of warfare imposed by steam navigation, a multiplicity of heavy smoothbore ordnance and later the rifled gun.

The prototype Martello towers, approved for the south coast at the end of 1804, which directly or indirectly determined the style of all but three of the British North American towers, were intended to be of the same pattern but in two different sizes. The larger, of which only two were built, were to mount 11 guns; and the smaller were to be armed with a gun and two carronades on top. Unlike their Canadian counterparts the English towers were not intended to be armed on their barrack floors. This is perhaps indicative of the concept of the home government that they were almost exclusively elevated sea batteries, difficult to escalade but little able to resist a land assault assisted by artillery, and so not requiring an extended flank defence. In British North America, however, their low cost and military popularity recommended their adaptation to a variety of circumstances in which such a carronade defence was essential. A standard feature of the English towers not generally found among those in Canada was a system of counterarches beneath the lower floor to increase the stability of the foundation. This was probably necessary because most of the English towers were located on beaches near the water where no firm footing was available. The only Canadian tower in a like situation, Sherbrooke Tower, built on a sandy spit in Halifax harbour, was similarly structured.[28]

The English south-coast towers were circular in plan, although they appeared oviform, as the external and internal circles were struck eccentrically to make the wall thicker on the seaward than the landward side. The later east-coast towers were to be 26 ft. in internal diameter, 33 ft. in height from foundation to parapet, with walls tapering from 9 ft. 6 in. in thickness.

All of these towers were built of brick, whereas in North America the preferred materials were either rubble or ashlar masonry, or a combination of the two. The English towers were two storeys high with the upper storey, covered by a bombproof arch, serving as accommodation for the troops. The lower floors of some were also arched and were usually divided by brick partitions into three or four compartments, one of which served as a powder magazine, the other being used for provisions and stores. A small cistern was usually built below this lower floor. Above the bombproof arch, each tower had a flat terrace or terreplein of solid masonry secured by a parapet and banquette all round. In these English towers the depth of masonry over the crown of the arch was rarely less than 5 ft. The usual height of the parapet was 6 ft. and the banquette was 1 ft. 6 in. wide. Entrance to the towers was by a door at or slightly above the level of the upper storey, reached by a ladder, movable stairs, or a drawbridge. The lower storey was reached by a hatchway and ladder or stairs through the barrack floor, while access to the terreplein was provided by a shaft cut through the arch or by a staircase cut in the exterior wall of the tower. The upper floor of the tower was always substantially loopholed while the lower storey was ventilated only by baffled airholes that denied an attacker any access to the tower on that level. The upper storey contained a fireplace for cooking and heating set in the exterior wall with a chimney through the wall to the top. The doors of the towers were always placed on the land side, it being the least likely to be subjected to cannonade.[29]

All English towers had domed, annular or simple arches. The most frequently found form, however, and the one incorporated in all of the south-coast towers as well as most of those built later in Canada, was the annular arch, which springs *from two concentric circular piers, one of which is formed by the exterior walls of the tower, whilst the other consists of a small round pillar, built in the middle of it. In any section taken through the center of a tower, constructed in this last manner, two arches will appear, but in reality they are to be considered as only one continued arch, the plan of which is circular, so that it encloses a space like a ring.*[30]

The interior faces of the parapet of English east-coast Martello towers were indented, or shaped in semicircles to conform to the demands of the traversing platforms on which their ordnance was mounted. Such terreplein ordnance required a platform diameter of 16 to 20 ft. depending on the calibre of gun, and the parapet was shaped to those dimensions.[31] The shaping was to permit the muzzle of the piece to project beyond the interior slope of the parapet at the time of firing to avoid muzzle blast effects on tower and gunners. A variation of this form of construction and gun mounting was incorporated in most of the towers built in the Canadas, though it was not copied in the Maritimes.

Despite the numerous British American technical adaptions of, and in some cases improvements on, the structural pattern of the English towers, the most salient distinction to be drawn between the two groups of towers is the often widely differing conditions of their use. Almost all of the British towers were erected on the open coastline or on the shoreline of harbours to resist a sudden assault from war vessels at sea. Restraints on their use as land defence works amounted to a generally accepted prohibition, as Pasley remarked in 1822:

> *It ought to be clearly understood, that the chief advantage of Martello Towers is their non-liability to be instantaneously entered and taken possession of, by sudden assault after the landing of an enemy: because as far as regards the mere effect of the guns mounted upon them, if engaged by shipping in a distant cannonade, there can be no doubt, but that the same number of guns would be equally efficacious, if placed in a common low field battery. The round figure of the Martello Tower is some advantage, because when exposed to a cannonade, all the shot, which strike it obliquely, glance off, without materially injuring the masonry. This advantage, however, is of importance only against ships, whose fire is uncertain. In opposing a land battery, constructed within a moderate distance, and firing with the usual precision, it would be of little avail, because almost every shot might be made to strike perpendicularly upon the centre of the building. Martello Towers therefore are not to be recommended in inland fortresses or positions; although no other kind of works are, upon the whole, better adapted for the defence of an open beach against a hostile fleet.*[32]

A few of the British towers were provided with dry ditches and bombproof masonry counterscarps and glacis but most were erected on beaches so close to the edge of the sea as to preclude such an expedient.[33] A few of the towers were in fact destroyed by erosion and heavy seas.[34] This limited use produced a curious blindness in Britain to the value of Martello towers as redoubted battery keeps, or to their isolated landward deployment behind similar cover in the smoothbore era, with the single exception of Twiss's unimplemented proposal of 1806.

In British North America, where different conditions of warfare were deemed to prevail, and where the engineer and other officers on colonial service were generally forced to seek inexpensive means of defending their batteries and other works against assault from any quarter, the above strictures on the use of Martello towers did not usually apply. Although there are several classic cases of the water-level location of Canadian towers, and other examples of their construction in situations that permitted only a single likely avenue of approach, these towers, both those projected and those actually constructed, were freely adapted to a wide variety of locally pertinent circumstances, including their use as battery keeps – revetted and unrevetted – in both land- and water-bound locales, and their employment as independent outworks inland. While the lack of wisdom of some of these choices was later recognized and measures planned or undertaken to increase their security from artillery fire, it is a fact that in British North America, Martello towers were employed with much greater versatility than they were in Great Britain.

It is this variety of adaptive employment over a wide geographical area, in numerous peculiar local circumstances and across the changing demands of a half century of British North American defence, that makes a detailed study of the construction, alteration and final disposition of the Canadian Martello towers a particularly valuable and instructive exercise. Though the first three British North American towers did not share the same technical progenitors as their later fellows, all, like their English counterparts, were aspects of an emergent British fortification technology initiated by an accident on the coast of Corsica in 1794 and definitively terminated with the widespread introduction of the rifled gun after 1860.

The Era of Great Construction: 1796-1815

Over half of the Martello towers ultimately erected in British North America were constructed and armed in the short span of years between 1796 and 1815. This was also the period when they were most likely to have seen use in combat. This figure includes, as is appropriate, the first three Halifax towers, which were not strictly Martello towers. It also encompasses the two later Halifax Martello towers, the four on the Plains of Abraham in advance of the Quebec Citadel, and the one built on the heights on the west side of Saint John, New Brunswick. In addition to the multiplicity of towers actually commenced or completed at these points, many more were projected for other places in British North America in this period, when tower-building was seemingly contemplated as an expedient for repairing almost every rent in the armour of the defence of the British provinces.

Even at the conclusion of the long war with revolutionary and Napoleonic France, the age of massive British North American defence that culminated in the present citadels at Halifax and Quebec, the fort at Ile-aux-Noix, and the heavy casemated redoubt of Fort Henry, Kingston, remained for the future. In those years, however, there was a qualitative change in the character of British American fortifications. This trend led away from the temporary batteries, refurbished French works and musket-proof wooden blockhouses that had marked previous British attempts to ensure the loyal colonies against France and America.

Both the means and the necessity for rationalizing the defence of colonies thrusting a thousand miles into the interior awaited a more propitious moment, but the year 1794 constitutes a benchmark in British endeavours to lend an air of permanency to the defences of the more salient points of the British American colonies. This process was often obscured by the feverish temporary preparations to meet imminent attack that characterized the early years of war, and was only imperfectly articulated in the more measured responses of the later years. There is, in this period, however, a discernible preference for building in masonry where possible, and it was this penchant for permanence that provided most of the impetus for the widespread use of Martello towers.

At the onset of war in 1793, British North America was a relatively minor constituent of an essentially European conflict, and the height of the danger was the threat of a pillaging assault from the French navy on the Atlantic coast. By 1807, however, after the blunting of the weight of French sea-power at Trafalgar, the focus of danger had shifted decisively to reveal an aggressive and antagonistic imperialism established on the very frontiers of British North America. The hostile appearance of the new United States and the likelihood of American military aggression produced a fundamental alteration in the nature of the requisite British military response in America.

The ten British North American Martello towers initiated before 1815 were primarily the result of a desire for permanent works and the special problems posed by a prospective American war. Their final form, number and locales, however, were also influenced by the availability of funds, geographical accident, and the personal predilections of governors, commanders and engineers.

The building process began at Halifax, where three round stone defensive towers were constructed between 1796 and 1799. These first towers, erected before the design or even the name "Martello" had been established in England, not surprisingly failed to conform in many particulars to the structural definition imposed by later British practice, although they were functionally similar to those in England. They do, however, display enough features of a common ancestry to merit their inclusion in a general study of such towers. This decision is reinforced by an analysis of alterations contemplated or actually undertaken during the first 12 years of the towers' existence further to adapt them to the general mold.

Halifax, founded in 1749, had served as a counterpoise to Louisbourg and functioned as an offensive naval base and staging port until the collapse of the French empire in America after 1759. The beginning of the American Revolution in 1775 and the ensuing reversal of the functional orientation of Halifax left its strategic role unaltered. The resulting loss of the Thirteen Colonies in 1783 greatly enhanced its value since it was now the preeminent strategic base for the defence of Britain's truncated American empire, and it was launched on its long history of service to the British fleet which constituted the only permanently effective defence of British North America.

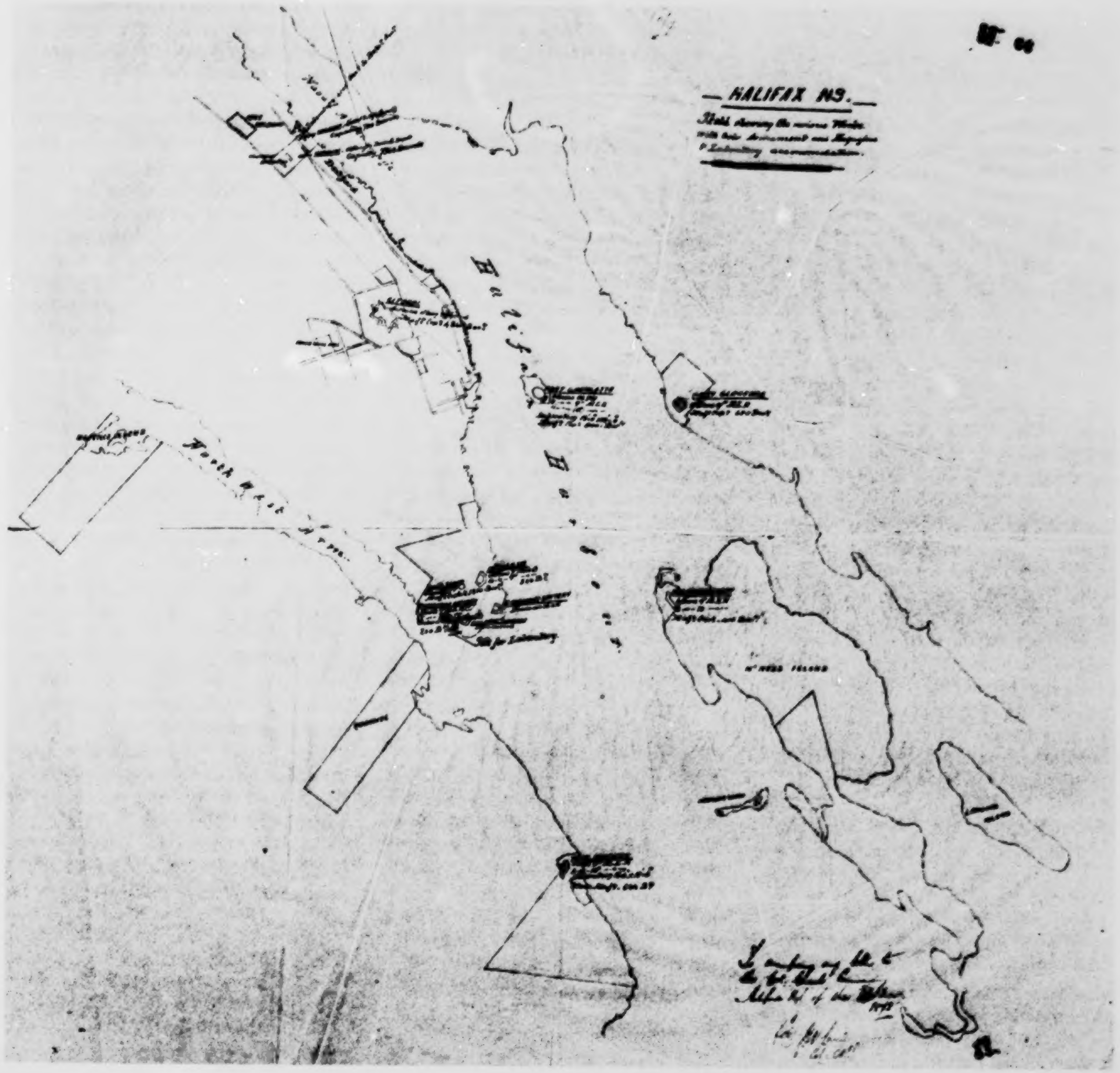
For a town and harbour of such enduring importance, Halifax was very imperfectly defended in the 18th century against the threat of hostile naval attack. With the collapse of the Indian danger after 1760, the undeveloped and virtually impenetrable country beyond the town freed Halifax from the threat of serious attack by land for decades, although the danger from the French and later the embryonic American navies remained unchanged. The first temporary Halifax sea defences were erected in 1750. Although they were much expanded, they had achieved no greater permanency when examined in detail in 1784, by Lieutenant Colonel Morse of the Royal Engineers. All of the major works were insubstantially composed of simple sods or fascines, haphazardly situated and constructed, and, in Morse's opinion, collectively incapable of preventing the passage of any enemy up the harbour.[1]

The ineffectual and decaying Halifax works observed by Morse continued to deteriorate through the decade of peace that followed.

Halifax's defences were largely ignored until the outbreak of war with France in 1793. In the summer of that year, General Ogilvie, commander of the forces in Nova Scotia, attempted to bring the old field works into a defensible state and to expand the number of batteries.[2] Ogilvie's tenure was brief and his improvements still incomplete when he was replaced by Edward, Duke of Kent, in 1794.

Edward, later the father of Queen Victoria and a wayward exile from the court of his father, George III, was serving out his banishment in military and other adventures in the colonies. Nonetheless, Edward was a competent officer in many ways, and his arrival signaled a new era in Halifax fortification. All previous Halifax works had been temporary constructions designed to meet immediate emergencies. Though he was bound by the same restrictive regulations as had hampered his predecessors, Edward's personal enthusiasm for elaborate and durable works and the influence of his rank allowed him to circumvent many of those restrictions and, in his six-year tenure in Nova Scotia, to bring the Halifax works to a level of permanency not achieved before. Edward's ill-advised impetuosity soon necessitated the alteration of a number of his efforts, but his penchant for building in masonry wherever possible permanently altered the nature of fortification in Halifax.

1 Plan of Halifax harbour and defences, 1875, showing works and armament.
(Public Archives of Canada.)



The first demand on Edward's attention was the completion of Ogilvie's work of putting the batteries in condition to meet an anticipated French naval attack. By the end of 1794 this task had been accomplished. It included upgrading the new Sandwich Point battery, commenced by Ogilvie in 1793 and later renamed York Redoubt; partly refurbishing the ruined Eastern Battery and Redoubt, later completed and renamed Fort Clarence; and completing three sea batteries on Point Pleasant, defending the harbour channel and the entrance to the Northwest Arm. In his résumé of completed improvements and proposed defences prepared in late 1794, Edward delineated all of the factors that were to preoccupy and condition the defenders of Halifax for the next seven decades. Among them, in addition to the major works he deemed necessary for Citadel Hill, Georges Island and command of the anchoring ground off Mauger's Beach, Edward noted the urgent necessity of defending the rear of the exposed sea batteries on the eastern shore, Sandwich Point, and Point Pleasant. These, he stated, would, with the presence of the fleet, afford adequate security to the harbour. Typically, Prince Edward, like his successors in the command of Halifax, failed to acknowledge the vital role of the navy in any defence. Without the navy the harbour remained virtually indefensible while with its presence the sea batteries were largely superfluous. This enervating view was not articulated and the new works proceeded apace.

By October 1796 Edward could report home that his projects for Citadel Hill and Georges Island were well in train. At the same time he announced that a two-storey blockhouse at the salient angle of the stockade of the Sandwich Point battery was completed, that the battery and redoubt on the Eastern Shore were finished except for a blockhouse he proposed to have erected there in 1797, and that the recently commenced stone tower in the rear of the Point Pleasant batteries was already two-thirds completed.[3]

Prince of Wales Tower

This last remark referred to the structure now known as the "Prince of Wales Martello tower." Although the completion of this work was delayed until 1799 by a lengthy financial controversy, this speedy beginning ensured the completion of a large two-storey masonry tower capable of carrying up to ten pieces of ordnance on its flat terreplein.[4]

While the European origins of the tower's design remain obscure, a little is known of its adaptation to the height behind the Point Pleasant batteries. Clearly it was not contemplated by Prince Edward in 1794, for at that time he specifically recommended defending the gorge of each of the batteries by means of log guardhouses and palisades in their immediate rear.[5] By the spring of 1796, however, with the whole military establishment caught in a wave of fear of the imminent arrival of the French West Indies fleet off Halifax, Captain Straton, the Commanding Royal Engineer, strongly recommended, and Prince Edward quickly approved,

The erection of a stone tower to carry on the summit of it, four sixty-eight pound carronades and two long twenty-four pounders, in a situation not only most amply commanding the three Sea Batteries . . . but also calculated greatly to annoy an enemy that might attempt to land in the Northwest Arm.[6]

This tower, it was felt, would remove the danger that the three batteries which constituted the principal sea defences of the western side of the outer harbour might be eliminated by *coup de main*, by compelling any assault force to reduce the tower some 400 yards in their rear first. It would seem likely that this combined defence was little more expensive and far more satisfactory than protecting each of the batteries individually. A tower was chosen over the more conventional earthwork, on the pragmatic grounds of speed and cost[7] because:

Earth being extremely scarce on the spot judged fit for such a work, and stone on the contrary being in great plenty, it was conceived that a stone tower would be constructed with as little trouble as an earthen work would have been.[8]

On technical grounds, the tower may also have been recommended because of the security from sudden surprise and escalade provided by its high scarp wall. This was much higher than could have been achieved in an earthwork at similar cost.

Construction of the two-thirds completed tower was halted in November 1796 on the orders of the Secretary of State, the Duke of Portland, who held that it was a permanent and not temporary fieldwork. Edward therefore, was in violation of the 1791 regulations permitting a local commander to undertake only temporary works in an emergency. The chief difference in the two categories was that permanent works had to be approved by Parliament under the authority of the separate Board of Ordnance, while fieldworks were funded from the military chest on the authority of the commander of the forces. The distinction, however, was often a nebulous one, and in this instance Edward's personal power moved Portland to intercede for *ex post facto* approval of the tower. Portland was successful in June of 1797 and work resumed thereafter.[9] Most of the 1797 working season was lost because of this dispute over Edward's authority and the circumstances of his order for the tower. By the end of 1797, however, only the cutting and placing of the coping stone for the merlons of the tower remained undone. To that date the tower had cost only £1,137.15.9 although a further estimate of £1,293 was then submitted for its completion. Much of this sum was to be devoted to external fixtures such as a ditch, counterscarp, glacis and palisade round the tower, although £387 was earmarked for the merlons and a further £67 apportioned for internal partitions. Approval of this supplementary estimate was communicated late in the 1798 season, and much of the work remained for 1799.[10] It would appear, however, that the tower was functional and defensible in 1797.

The finished Prince of Wales Tower was an imposing structure, and, as with many of the other Halifax works, Edward named it after a member of the royal family in 1798. The tower was a circular rubble masonry structure 72 ft. in exterior basal diameter and 26 ft. high from ground level to the top of the parapet. Its slightly inward-sloping wall was 8 ft. thick at the bottom and 6 ft. at the parapet. The two interior storeys were surmounted by a three-foot-thick timber roof, forming a terreplein 60 ft. in diameter behind a six-foot-high parapet. This roof was sustained at the centre by a hollow, circular, rubble masonry interior wall extending down to the foundation of the tower. This wall, concentric with the exterior face of the tower, created a central room 16 ft. in diameter on each of the levels in addition to the larger room, 16 ft. wide all round, formed between it and the exterior wall of the tower.[11] The exterior wall was pierced with 35 loopholes on the ground floor as a means of musketry flank defence in addition to eight loopholes on the upper level, which was also provided with four embrasures for cannon. The parapet was pierced for 12 cannon embrasures; the more functional barbette terreplein ordnance system was not adopted in Halifax until some years later.[12]

The various early means of access to the tower remain a matter of some dispute. It appears certain from a remark of Prince Edward's, in which he referred to, "the bridge and Staircase to the top by which you ascend to the tower on the outside," that a spiral staircase was one of the first expedients. By 1812 a ground floor door had appeared. It could have been created at any time after the inception of the tower, and if it were not one of the original features it may have well been opened at the same time as the magazine, which appears to have been constructed about 1805 and which was certainly present by 1810.[13] The typical second-storey Martello tower entrance door evident today was only added as an afterthought in the 1860s and it appears the exterior staircase had been removed by 1812.

With the external staircase, interior access must have been provided by a hatchway in the terreplein, leading down by means of a ladder or stairs to the upper interior storey which was used as a barrack. Communication between the barrack room and the lower floor was provided by a narrow stairway winding down through a passage in the exterior wall of the tower near the site of the present ground-floor door. There may also at that time have been hatches for stairs cut through the wooden barrack floor. Lateral communication between the inner and outer rooms on each level was by means of doorways cut through the interior masonry wall.[14]

The permanent interior fittings of the tower were quite simple. On the lower level they consisted of two cisterns sunk below the level of the floor and, somewhat later, the small brick magazine partitioned off in the outer room. The ground level loopholes were also served by a wooden banquette around the wall. The basement floor was unheated while the barrack floor above was provided with two fireplaces recessed in the exterior wall and vented through it. Wooden partitioned officers' rooms and berths for 96 men were added on this floor on completion of the tower, but were soon removed to improve the air circulation within.[15]

On the completion of the Prince of Wales Tower in 1799 there were significant disparities evident between it and the common Martello tower type. The most notable were its great overall diameter, the uniquely large dimensions of its hollow central pillar and its lack of bombproofing. It also lacked the typical means of access of such towers and differed to the extent of having no magazine of its own. Neither were its lower floor loopholes or embrasured parapet features of the later structural definition of such towers. Over the succeeding 13 years alterations were undertaken to some of the more changeable of these deviations, bringing the Prince of Wales Tower into much closer conformity to the then well-established functional pattern of Martello towers.

The first of these changes came in 1805 with the addition of a badly needed expense magazine with a capacity of 80 barrels of powder, while the other changes remained for the major reconstruction approved by the Board of Ordnance on 27 July 1810. These instructions gave permission to throw a bombproof arch over the tower to protect it from plunging fire. This was intended at the same time to end the complaints, which had been a running feature of reports on the tower since 1803, that water was leaking through the faulty wooden roof and destroying the interior. This work was undertaken in 1811 and completed before the end of 1812; the old wooden terreplein was removed and a heavy brick arch erected in its stead. At the same time, the parapet embrasures were filled up so that in future the ordnance would be mounted en barbette. Following these alterations, terreplein access from the interior was by an aperture, capped by a wooden cupola, cut through the centre of the new arch. This was reached from below by a ladder or stairs leading from the central room on the barrack floor of the tower.[16] All these changes did not make the Prince of Wales tower into a standard Martello tower, but they did provide it with many functional similarities.

The armament of the Prince of Wales Tower was not quickly and permanently established. It may have been armed before 1802, but by that time it mounted four 6-pounder guns on its barrack level and two 24-pounder guns and four 68-pounder carronades on its top platform. The heavy carronades were progressively removed between 1808 and 1810 and replaced by a 24-pounder carronade after the alterations of 1811-12. By 1813 it mounted four 6-pounder guns on garrison carriages on its barrack level, and two 24-pounder guns on traversing platforms and six 24-pounder carronades on traversing slides on top.[17] The nature and quality of this ordnance then remained unaltered for 50 years.

By the time its armament was stabilized, the tower had been fitted with those military accoutrements that were to characterize its state of preparedness through the War of 1812 and into the early years of the era of peace that followed. It had been used as a supply house and provision depot for the Point Pleasant position as early as 1805, and it appears that the tower, which had an emergency capacity of 200 men, was shortly thereafter provided with a store of arms and provisions for their use. This amounted to 72 stands of arms, 12 pairs of pistols, and 30 boarding pikes. Thirty-six barrels of powder had once been stored in the tower magazine but had been injured by dampness, so by 1811 the powder was kept in the nearby Point Pleasant magazine. The onset of an American war, however, altered this arrangement once more, and 100 rounds for each piece were stored in the tower in addition to the 10,000 musket ball cartridges previously lodged there.[18] With its other fittings, the tower was thus equipped to withstand an extended attack.

It appears that, despite the initial provision of barrack accommodation and the retention of its heating and cooking facilities, the Prince of Wales Tower was not regularly appropriated as a barrack. This was the case, despite the lack of alternative accommodation on the isolated point, as it proved too cold and damp for permanent use. In the event of an attack, the tower, like the other smaller works, was apparently to be manned by militiamen and by such regular gunners of the navy and Royal Artillery as might be available.[19] The need never materialized and the tower remained a largely vacant sentinel to the alarms of war.

The design and early history of the Prince of Wales Tower were roughly paralleled in two other towers constructed at Halifax under the direction of Prince Edward. Both of them were undoubtedly inspired by the rapid progress and official popularity of the original tower. However, each possessed characteristic features that made it more than a poor imitation of the first Canadian tower. For the most part these traits carried them farther than ever from the English model, although modified versions of their most salient features were later to appear in other Canadian Martello towers.

Fort Clarence Tower

The first of these towers to merit consideration is the Duke of Clarence's Tower or Fort Clarence tower within the Fort Clarence Redoubt on the east side of Halifax Harbour opposite Georges Island. This position, known prior to 1798 as the Eastern Battery, was first occupied in 1754 when a battery of guns was placed there to co-operate with Georges Island in defending the 1,500-yard-wide eastern passage. This battery was commanded from rising ground a few hundred yards in its rear and subsequently an oblong earthen redoubt was erected behind it to assist in its defence.

By 1784 both battery and redoubt were in a ruinous state and they continued to deteriorate for another decade. Prince Edward renovated the position after 1794, and in 1796 pronounced it complete, except for the addition of a blockhouse in the interior of the redoubt which he proposed adding in 1797. This blockhouse was not added because Edward soon decided to substitute a round tower for it. The building materials for the tower were already gathered by April 1798, when Captain Straton, the Commanding Royal Engineer, announced his opposition to its construction. Straton urged that the whole work should be abandoned as it was defective in a manner not rectifiable by a tower keep as the redoubt itself was commanded from above. He suggested that the tower materials be moved and used to form a battery keep in a more secure location on McNab Island. Edward persisted, however, and the masonry of the tower was completed by October 1798, although the external stair had not been placed nor the parapet coping provided as late as 1803.[20] Thus this tower was erected, seemingly on Edward's whim and against the advice of his engineer officer, in a location effectively commanded at 300-500 yards distance.

Despite its seemingly dubious military virtues, the tower's enduring role in an important harbour position render its structural and defensive features worthy of some consideration. The tower was 50 ft. in exterior basal diameter and 42 ft. high from foundation to parapet, with an exterior sandstone masonry wall uniformly 6 ft. thick. Because of the need to provide emergency accommodation for the whole garrison of the isolated Fort Clarence, it had three rather than the usual two storeys. The whole was capped by an unbombproofed terreplein composed of two feet of layered timber topped by 1½ ft. of plaster of paris surrounded by an embrasured parapet. The terreplein and interior floors were supported by a thin-walled hollow central pillar concentric with the exterior wall, extending from top level to ground and forming a small central room some 6 ft. in diameter. This was suitable for communication or for hoisting ammunition to the top of the tower, and was probably employed for that purpose.

In spite of the tower's 42 ft. height, it would have appeared no taller than other towers from a distance because a full 8 ft. of this height were hidden by a seven-foot-wide ditch surrounding the tower.

This ditch was spanned by two loopholed caponiers on opposite sides of the tower. They provided both a flanking fire at its base and a secure communication to the timber-roofed subterranean magazine and cookhouse that flanked the tower on either side beyond the ditch. The tower was not intended as a permanent barrack and the external fixtures above enumerated, along with an excellent well, must virtually have eliminated the need for internal barrack fittings. There are, however, later indications of a fireplace and of the internal partitioning of the lower level for emergency use.[21] The wall of each of the three interior storeys was pierced by loopholes for musketry and each of the upper and lower barrack floors above the basement was provided with four embrasures for cannon. The parapet on top was pierced with eight embrasures for guns or carronades.[22] The completed tower had only one intended means of access, an external iron staircase to the top.[23] It is not known where on the terreplein the hatch leading inside was located, nor what means were used in internal communication. The Duke of Clarence's Tower was not as strong a work as that on Point Pleasant, but its position within the fort may have made such strength seem unnecessary.

The completed Fort Clarence tower conformed fairly closely to the Martello tower pattern in some ways, but there were disparities in height and in the nature of its internal pillar, its lack of bombproofing, lower floor loopholing, mode of access and embrasured parapet. Its most interesting feature was its caponiers. In possessing these it was unique among the British North American towers until a variation of this feature was adopted at Kingston 48 years later.

The tower underwent alterations in the 14 years following its nominal completion, although they were of less consequence than those undertaken at the Prince of Wales Tower. The long neglected external stairway was finally put in place, although in 1812 it was removed and replaced by a door at ground level leading into the second storey of the tower. This door was reached by a drawbridge across the ditch. In the same year a small brick magazine of 100-barrel capacity was constructed within the tower, as the subterranean one nearby was badly decayed. The unbombproofed terreplein had been a frequent cause of engineer complaints, but in 1812 it was replaced by another timber roof. This failure to improve the tower top's defensibility against high-angled fire may have resulted from the inability of the thin central pillar to sustain the weight of an arch. Another alteration carried forth at the same time was filling the parapet embrasures on the landward side and cutting the parapet down to 3 ft. toward the water, so as to retain the protection in the potentially threatened rear while converting it into a barbette work on its less exposed seaward face.[24] These alterations were undertaken to bring the tower into closer conformity with its military environment, and they much improved its potential defensibility in the war that soon occurred.

The Duke of Clarence's Tower had been built to mount up to 16 pieces of ordnance in all. It was probably armed about 1805, but no tabulation of its mounted ordnance appears prior to March 1808. The tower was a battery keep rather than an offensive sea battery, and was always armed accordingly. It had carronades and howitzers in preference to guns of longer range. In 1808 it contained 12 pieces; four 32-pounders and four 24-pounder carronades on top and four antiquated 8-inch brass howitzers mounted within. By July 1810, two of the howitzers had been removed, and by 1812 all of them had been replaced by four 24-pounder carronades mounted on the barrack level on wooden carriages. In 1812 the top armament of the tower consisted of eight 24-pounder carronades on traversing slides mounted en barbette.[25] This armament gave it a ferocious firepower at short range, but denied it a larger role.

All of the tower's defensive equipment was installed by 1812 and was never subsequently upgraded. The barrack floors of the tower were fitted for arms storage, and by 1808 contained 200 muskets, a proportion of pistols and pikes, and 20,000 musket cartridges for the use of the defenders. This equipment, with the addition of 100 rounds of powder and shot for each piece, remained in place for some years.[26] The tower was not deemed fit for barrack accommodation, and by 1812 alternative quarters had been prepared for the small regular garrison of the work.

The tower was intended to be defended by up to 164 men, who were to be drawn from a company of volunteer artillery on the Dartmouth side, bolstered by a leaven of the Royal Artillery stationed in Halifax.[27] This tower suffered from two great weaknesses; its location below and in front of the commanding height and its vulnerability to mortar fire. Despite its use as a battery keep in the manner recommended by Colonel Twiss and other influential engineer officers, it is perhaps fortunate that its defensive merits were never tested from the land.

York Redoubt Tower

Edward's other Halifax tower was also an innovative structure and is likewise difficult to classify as a Martello tower. This was the Duke of York's Tower in York Redoubt. This so-called "redoubt" was a sea battery located on a high bluff overlooking the outer harbour channel from its western side. Ogilvie had opened a battery there in 1793, and Edward further upgraded and stockaded the position between 1794 and 1796. By the latter year he had also added a wooden blockhouse to the salient angle of the palisade in the rear of the eight-gun battery and at that time he reported the position complete. He soon reconsidered, however, and by 1798 had removed the new blockhouse and replaced it with a round masonry tower of rough quarried stone. His rationale is uncertain, though the blockhouse may not have provided the desired security or carried the weight of ordnance deemed necessary in its isolated location. The whole redoubt remained a very weak one, mainly dependent for its security on the freedom from naval bombardment provided by its great height above sea level, and from an artillery assault in its rear by the rough and inaccessible nature of the land.

The finished two-storey tower was 40 ft. in exterior diameter at the base and 30 ft. high to the level of the terreplein. Its walls were uniformly about 4 ft. thick. The tower had a thin-walled hollow circular central pillar similar to that of the Fort Clarence tower that extended its entire height. The interior space thus created was likewise suitable for hoisting ammunition or for the placement of a communicating staircase.[28]

The flat terreplein of this tower was of wooden construction as favoured by Edward and Straton. It was, however, unique among Canadian towers in that its circular parapet was constructed of the same material. This expedient was dictated by the need for the rapid completion of the tower rather than by the conscious design of its builders.[29] The first wooden superstructure appears to have been formed by simply laying the terreplein timber on top of the exterior masonry wall and extending it four feet beyond the edge all round. The four-foot-high musket-proof wooden epaulement was then attached around the extremity of the terreplein. A *de facto* machicolation gallery was thus created all round the tower, as a plunging fire could be brought to bear on the base of the tower from holes cut in the projecting portion of the terreplein. The parapet wall was loopholed for musketry and embrasured for cannon. This top defence was supplemented by embrasures, and probably by loopholes, on the barrack level immediately below.

Once again the nature and extent of the entrances to the tower are difficult to determine. It is known that entrance to the tower was later achieved by an outside staircase to the top, and, given the examples of the Prince of Wales and Clarence towers, this was probably the original means of access. This was later supplemented by a barrack-level entrance reached by a drawbridge over a ditch from the exterior of the work and by a ground-floor entrance door. The original means of internal communication is uncertain, although later the space within the central pillar was appropriated for this purpose. The first terreplein entrance hatch was probably also at this point.[30]

The Duke of York's Tower appears to have been provided with its own small bombproof brick magazine after 1811. Otherwise its main military features remained unaltered for several decades, as it missed the flurry of alteration just prior to the War of 1812. Despite Captain Fenwick's early allusions to the weakness of the wooden parapet and terreplein, Lieutenant MacLauchlan, his successor, who appears not to have been very competent, declined to renew them in masonry. MacLauchlan commented that the local building stone was so "weak, bad and expensive" that such an endeavour would not be worth the effort. Consequently the old roof was replaced by another one of wood in 1809, and nothing else of substance was altered until the 1860s.[31]

Probably the tower was armed before 1808, although its first ordnance return dates from that year. At that time it mounted two 6-pounder guns in the interior embrasures and two 12-pounder and two 24-pounder carronades at the embrasures on top. By 1810 the top ordnance had been altered to six 12-pounder carronades, at which level it was to be maintained. The heavy carronades were apparently removed without qualms, perhaps because several smaller pieces were more desirable in a position whose main danger arose from an infantry assault. This trend to more pieces of smaller calibre was general among the three towers. By 1812 it had also been provided with 111 muskets, pistols and pikes, and 10,000 ball cartridges.[32] Afterwards its armament remained unchanged for 50 years.

This tower was in fairly constant use for barrack purposes. It was occupied as early as 1800, though it contained no adequate regular barrack facilities. Its small garrison fluctuated from a few privates and a non-commissioned officer to eight Royal Artillery gunners in the 1800-15 period.[33] Their primary function was to raise the alarm and man the guns in case of attack, as the redoubt was the first harbour position to take up an approaching fleet. In the absence of an enemy, however, theirs was largely a caretaker role over the arms and facilities of the isolated position. They may also, from the outset, have performed the signalling function that was to keep the tower in use for many years. In a real emergency this small force was to be supplemented by up to 100 militiamen lodged in the tower.

It can be seen that the Duke of York's Tower was the most primitive of the three Edward had constructed in Halifax. In many ways it resembled the other two but its most salient feature was the accidentally created machicolation gallery, making it more reminiscent of a frontier blockhouse than a bombproofed masonry Martello tower. Despite its structural inadequacies, it was not badly adapted to the requirements of its almost inaccessible position, and when armed and prepared for war it was undoubtedly the strongest feature of the weak redoubt, not only at that time but until the 1860s.

Prince Edward left Halifax in 1800 soon after the completion of his three stone towers. Despite their common overall structural pattern it is evident that none was a Martello tower in a narrow sense, their divergent origins being displayed most particularly in their hollow pillars, mode of access and lack of bombproofing. All were adapted to rectify defects of design and meet anticipated future military needs in the years before the War of 1812. In the case of the Prince of Wales Tower, these changes brought it closer to a definition of a Martello tower, but all the work was undertaken more to bring the towers into conformity with purely local defensive needs than from a deliberate desire to turn them into regulation Martello towers. While the towers were apparently adequate for those needs after they were properly armed and equipped, they were on the whole an evolutionary dead-end not copied elsewhere in British North America.

While Edward's towers were not copied, their completion by no means exhausted the popularity of round stone towers in the Halifax area. In 1801, Captain William Fenwick, the Commanding Royal Engineer, who was generally a severe critic of Edward's works, proposed three massive masonry towers, two to defend the extremities of the Citadel Hill work and another to command the dead ground below the Georges Island star fort. These works were large and elaborate caponiered towers 78 feet high and 50 feet in diameter, and, at £9,600 each, so costly that the proposal was quickly dismissed.[34]

These and Edward's earlier proposals had been designed to meet the threat of French naval attack, but by the end of 1807 a new danger of hostilities with the United States had emerged. At that time MacLauchlan, the engineer, proposed a round tower to occupy a height to the north of Needham's Hill on the Halifax peninsula. The work was approved under the authority of the local commander of the forces, but the lateness of the season for masonry work forced the substitution of a musket-proof blockhouse. War preparations continued into the spring of 1808, and a number of Martello tower proposals were put forward, chiefly at the instigation of Captain Gustavus Nicolls who had replaced MacLauchlan as commanding Royal Engineer in Nova Scotia.

Captain Nicolls' proposals were prompted by the virtual indefensibility of the town, harbour and dockyard, and were seconded by Major General Martin Hunter and Sir George Prevost, successive commanders of the forces in Halifax. Nicolls adopted MacLauchlan's plan for erecting towers on the hills to the east of Halifax in the rear of Fort Clarence,[35] and General Hunter said of this proposal:

It is the opinion of the Chief Engineer here, in which I perfectly agree with him, that on the Dartmouth side of the harbour of Halifax, where there is only one Martello Tower that three more could be placed to great use, indeed I think absolutely necessary for the protection of the Dock yard and Town.[36]

The general's comment constituted the first explicit Canadian recognition of Martello towers, for Edward's towers were not known by that name. It achieved little else since a shortage of building materials prevented construction of the Dartmouth towers.

Nicolls further proposed three more towers, mutually supporting and for 120 men and 4 pieces each, to shut off the entrance to the Halifax peninsula. Lastly, he recommended that a Martello tower be constructed within Fort Needham to command the adjacent ground. He defended his choices by saying:

I consider the construction of the towers . . . would constitute the cheapest, most permanent, and most effectual defence; at the same time requiring the smallest number of men.[37]

Captain Nicolls' scheme was stillborn with the declining likelihood of an Anglo-American war. Its most enduring virtue rests in the insight it provides on the colonial popularity and attractions of the new Martello towers. Nicolls was a competent and intelligent officer who later achieved high rank in his corps. He approved the towers primarily because they were cheap and could be completed in a single season, providing both emergency protection and fortifications of enduring value.[38] They must also have seemed a god-send in a climate where hard frosts could destroy laboriously constructed earthworks in a single season.

Nicolls' proposal also indicates an early and basic adaptation in the use of such towers. He may not have been intimately aware of the British principles of locating these works, construction of which had only recently begun. He proposed shielding some of his towers behind ditch, glacis and counterscarp, but his plan violated the prevailing orthodoxy and the almost universal custom at home of not generally building the towers in inland locations where they would be exposed to fire from land-based artillery. It was the generally, and perhaps accurately, accepted view that they would be breached quickly in such circumstances.

Quebec Martello Towers

Gustavus Nicolls's tactical heresy at Halifax was of little immediate significance. At Quebec, however, it was at that moment being carried into effect for much the same reasons it had appealed to him and other officers in the Halifax command. The reasons behind the commencement of the Martello towers across the Plains of Abraham in 1808 rested in the whole lethargic history of its fortification since the British triumph in Canada in 1759. The towers were finally precipitated by the same Anglo-American crisis that had prompted the new proposals for the defence of Halifax.

The city of Quebec was the key to the control of the continental interior for both France and England, and both nations understood the basic principles of its defence. Quebec is located on a triangular point of land at the junction of the St. Lawrence and Saint-Charles rivers. The French exploited these natural river flanks and extended a line of works between them facing toward the plain in the rear of the town. The St. Lawrence scarp rose so steeply as to be unassailable within the line of works, but on the other side the land dropped off more gently toward the shallow Saint-Charles River which was fordable at low tide. Before 1759 this vulnerable flank was not defended by even a continuous wall around the town.

Despite the importance of Quebec and the danger of a renewed French war, the English were slow to improve its defences after 1763. Some work was carried out on the Cape Diamond promontory between 1779 and 1783 but because of the peace it was left unfinished. For many years nothing more was done, though as early as 1791 Gother Mann reported to Lord Dorchester the proper principles for its defence.

Mann proposed enclosing the entire two-mile circumference of the upper town to prevent a *coup de main* and reduce an enemy to one point of serious attack, across the Plains of Abraham. To defend this vital flank he wanted to carry a line of outworks to the Heights of Abraham, forcing an enemy to reduce them before he could open batteries against the main defensive line. Mann further proposed a citadel on Cape Diamond to serve as a keep for the whole. In Mann's opinion these three defensive lines, in conjunction with the short Canadian campaign season, would be sufficient to retain Quebec until it was relieved by the onset of winter or the arrival of reinforcements. No immediate action was taken and Mann left Quebec, only to be recalled from the army in Flanders in 1794 for the express purpose of carrying into immediate effect part of his design for its defence. Priorities changed again and almost nothing had been accomplished as late as 1804, though Mann reiterated his proposals in 1799 and 1804, each time stressing "the manner and expediency of occupying the Heights of Abraham . . . for the better defence of the City of Quebec."[39]

Mann listed the occupation of the heights as second in importance after the completion of the line wall around the upper town. Once it was finished any attack must necessarily be funnelled across the Plains of Abraham, from which the whole main defensive line was commanded from the Ursuline to the barrack bastions at 800 yards distance. From there an attacking force could open a regular siege and bombardment of the main works. The heights were a difficult defensive proposition because, as Mann explained,

> *although too near the Town to be left to the possession of an Enemy they are on the other hand too distant to allow of the works which might be constructed there, to be connected with those of the place. They must, therefore, be regarded as detached works.*[40]

Mann therefore recommended four strong mutually flanking redoubts across the heights, scarped in masonry and provided with defensible masonry blockhouses as keeps. The redoubts were to be connected by fieldworks and supported in an emergency by an entrenched camp in their rear. He felt it unnecessary that these works have a great profile, and, as well, it would have been difficult to excavate deep ditches in the rock. He estimated the redoubts would cost £12,000 in all.

Mann had been closely concerned with the defence of Quebec from 1789 when he was a relatively junior officer, but by 1804 he was a major-general in the army and an influential colonel of engineers. His last proposal was taken up by the Committee of Engineers in England and sparked a controversy with its chairman, General Morse, the Inspector General of Fortifications. Morse refused to recommend the works of the plains because from the heights the town works could not be reduced, and "in the event of these advanced works being forced the troops would be liable to great loss in their retreat." Mann responded that if the heights were not defended they could be used to provide covering fire to move batteries within 450 yards of the main works, from which distance they could be breached.[41] Mann's view was strongly sustained by the Earl of Chatham, the Master General of the Ordnance, who took up his case with the Earl of Camden, the Secretary for War, saying, *as I have no idea of any circumstances, under which the attack of Quebec could be likely to take place, that would not render this measure of peculiar advantage and utility, even independent of the assistance of these outworks to the Defence of the place.*[42]

At the same time Chatham saw no urgency in constructing the outworks as the Plains of Abraham could be occupied quickly by guns and fieldworks in an emergency.

Fifteen years of endeavour on Gother Mann's part failed to achieve a commitment to permanent works for the Plains of Abraham. As long as the drawn-out French war remained an essentially European conflict, the proper defence of Quebec was a matter of no great urgency or consequence as any attack on it was contingent on the triumph of French sea power. By 1807, however, deteriorating Anglo-American relations and the imminent prospect of another American war placed a hostile power at the doorstep of Quebec. The British government feared that in the event of war American naval inferiority might produce a compensatory invasion of British North America. Any attack along the extended and indefensible frontier would necessarily be directed at Halifax or Quebec; a sudden successful attack on Quebec could deprive Great Britain of the whole continental interior and the means of re-entering it before succour could be sent from England. Consequently the new governor general of British North America, Lieutenant-General Sir James Craig, was instructed in August 1807, just prior to his departure from Britain, to improve the defences of Quebec and defend it to the utmost.[43]

Craig arrived at Quebec late in 1807, with instructions to build temporary works to prolong the siege in case of war or to improve the permanent works if there were no war. The Embargo Act passed by the American Congress on 22 December 1807 eased but did not eliminate the possibility of war.[44] In the spring of 1808 Craig found an essential conflict in his instructions, as the measures demanded by each contigency were quite different, and he confessed himself unable to assess the likelihood of war; at the same time he felt it would be foolish to wait on a result. Craig was opposed to unnecessary and wasteful expenditures on temporary works, and so compromised by commencing those permanent works that would be of the most immediate use in supplementing the dangerously exposed existing fortifications.

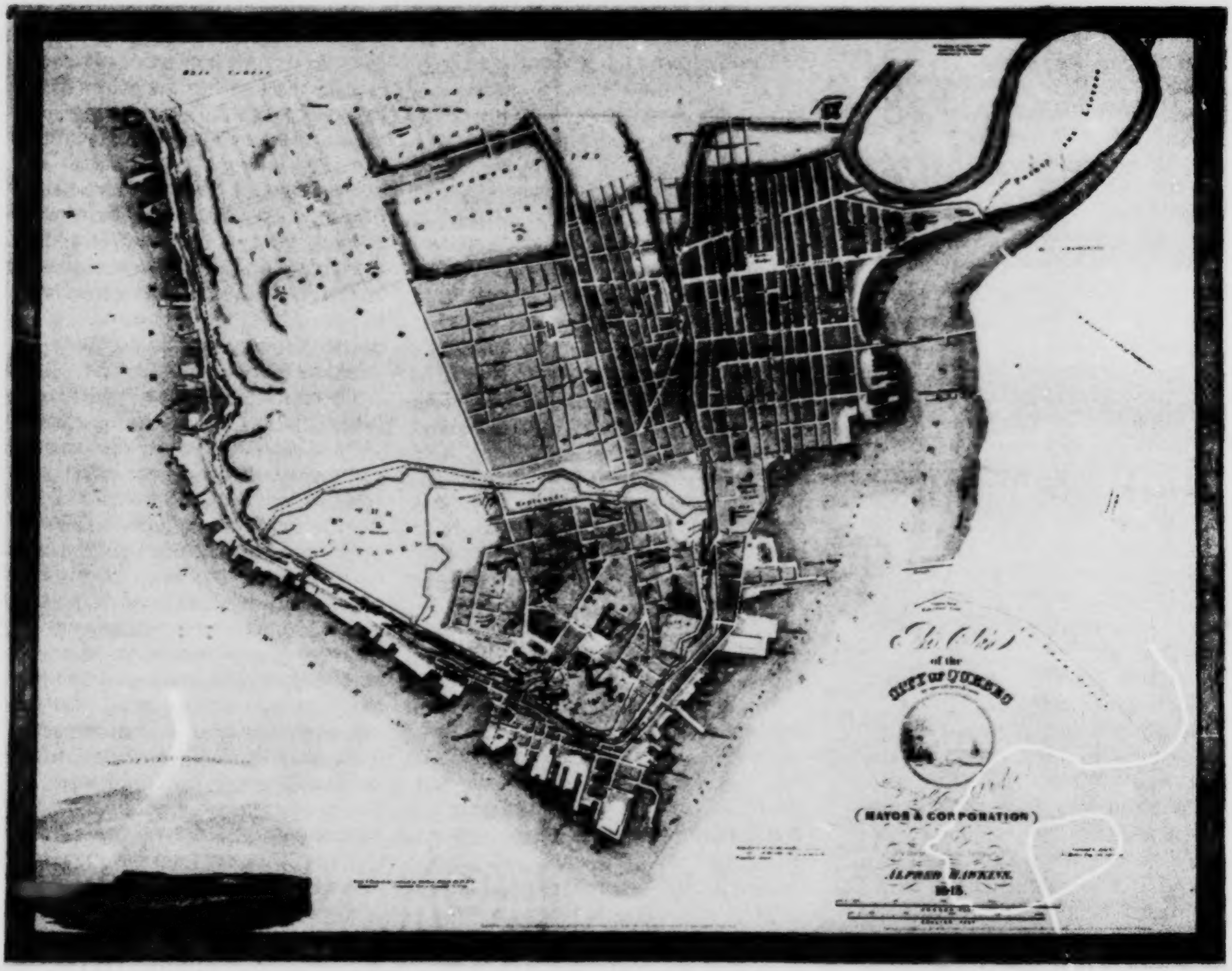
In general, Craig accepted Gother Mann's assessment of Quebec's tactical needs. The order of priorities was: completing the wall around the town, covering and protecting the exposed town walls, strengthening the outworks in front of Cape Diamond and occupying the Heights of Abraham with advanced towers. Craig stressed that if all were not done the remainder would be useless and Quebec not defensible for four days. He acknowledged the necessity of a citadel on Cape Diamond to complete the defences, but deemed it beyond his time and resources.[45]

Craig's first three measures were not at all controversial; they were in accord with the accepted needs of Quebec and within the scope of his instructions. These same instructions, however, had specifically precluded his proceeding to a permanent occupation of the heights before referring his views to the home government for decision. In the event Craig, impressed by the vulnerability of the works from the plains, did not report any of his measures home until July 1808, when all were in progress.[46]

Using the general ambiguity of his instructions as an excuse, he stated that the absolute necessity of occupying the heights was too obvious for much deliberation.

But the mode most eligible under the circumstances of our situation of doing so, required every consideration that we could give to it . . . the occupying them at the least expense of men has been the principal object with us – and it is upon that principle as well as on the consideration of their requiring the least time in their construction, that we have determined on a range of Towers on the most commanding spots across the height, four of them will be sufficient but in order to furnish a more considerable line of fire than they would afford, we proposed a small work connected with that which has the most extensive command, – we are well aware of the objections that may be made against the mode, but we are not the less convinced that under all the circumstances of the situation, it has very far the advantage over every other that could be proposed and we shall endeavour in

2 Plan of the city of Quebec, 1845, showing the locations of the four Martello towers.
(Public Archives of Canada.)



their construction to adapt the best means for meeting the circumstances on which those objections are founded. I have no doubt my Lord that Engineers whom your Lordship may consult will advance and enforce those objections, nor will the limits of a letter admit of my entering into that discussion upon the subject, that might be necessary to encounter their arguments; but I agree most perfectly with Lieut.-Colonel Bruyeres who commands the Department here, and a reference home on a subject, on which there would be such a diversity of opinions, would certainly have consumed that time in which they ought to be constructed.[47]

Thus the British government was informed that four Martello towers were already in process of erection at Quebec. A reference to Mann's experience would indicate that Craig was correct in his private view that a referral of the issue would "probably have been the occasion of its never being done."[48] His action was accepted without demur and construction was permitted to proceed.

While Craig's contravention of his instructions ensured the building of the towers, his disinclination to discuss the issue leaves the origin of their choice in some obscurity.

It seems likely that the decision to use Martello towers originated with Craig himself, rather than with Bruyeres, the Commanding Royal Engineer. This is particularly indicated by the fact that Craig was responsible for the commencement of two towers at the Cape of Good Hope in 1796 and was the commander of one of the affected English military districts when the English tower idea was conceived in 1803 and 1804. This assessment is corroborated in a letter from Bruyeres to his counterpart in Halifax in March 1808, asking for plans of the largest tower constructed there and for a description of the point on which it was located. This information was returned on 18 March 1808. In the event, the Quebec towers, three of which were completed by November 1810,[49] owed a far greater structural debt to their counterparts in Great Britain than to the Prince of Wales Tower. The reference to Halifax was probably an attempt to justify the use of the towers in a land defence role.

The proposed towers were not named but simply numbered consecutively from the left, or St. Lawrence, flank. They were to be of one design but of two different sizes. Towers 1 and 4, at the extremities of the line overlooking the St. Lawrence and Saint-Charles rivers respectively, were intended to be one-gun towers 45 ft. in diameter and 30 ft. high; towers 2 and 3, spaced evenly along the centre of the line, were to be three-gun towers of the same height but 52 ft. in exterior diameter. The cost of the four was estimated at £8,000 in all, while a proposed redoubt in advance of tower 2 would have added another £5,000 to the cost of the line. This redoubt, with a masonry scarp, two bombproof caponiers to defend its ditch and bombproof casemates for troops and stores, was intended to bolster the tower line at its highest point. The line of towers was about 850 yards in front of the main works of Quebec and in advance of the suburbs of the town. They were placed at roughly equal distances in a 1,200-yard extension across the plains.[50]

While the four Martello towers were one of the salient points of Craig's and Bruyeres' plan of 1808, they by no means exhausted the anticipated utility of such structures at Quebec. The same plan called for a one-gun tower in advance of the old Cape Diamond outworks to command the beach and cliff of the Anse des Mines, at a cost of £1,800. A strong one-gun tower similar to those on the plains was to be built on the opposite side of the Saint-Charles to command the point of enfilade of the town works some 900 yards distant at £3,000, and a similar one-gun tower on Point Lévis on the opposite shore of the St. Lawrence, 1,500 yards away, to prevent a bombardment from that quarter. However, the short working season for masonry and the labour shortage induced by wartime prosperity combined to slow the works in 1808, so none of these three towers was ever built.[51]

The same factors mitigated against an early completion of the towers on the heights, though Craig accorded them a high priority.

At the end of 1810 he had to report that, "with all the assiduity we could extend on them, however, we have only been able to finish three of the four proposed towers and lay the foundation of the remaining one." Work on tower 4 overlooking the Saint-Charles River continued in 1811 when the construction was carried to an advanced stage, though it was not completed in that year. The tower's advanced state and the threat and then outbreak of hostilities in 1812 ensured its completion early in that year,[52] and all four towers were serviceable by the onset of war.

The Quebec towers were built under the authority of the commander of the forces in Lower Canada, and as such were funded from the military chest and not carried to Parliament as part of the Ordnance estimate. The towers were constructed as far as possible with military labour and under the direct supervision of the engineer department. This method of constructing the towers resulted in a confused tenure of the ground on which they stood, as the sites were simply appropriated by the military in the 1808 emergency. All of this land was owned by the Ursuline and Hotel Dieu convents which, until 1787, had kept it entirely open. In that year, against Gother Mann's advice, they were allowed to enclose and lease it. By 1808 most of the property was in the possession of long-term leaseholders who claimed losses as a result of the action of the military. These claims were not sustained, but the tenure of the land around the towers was only regularized piecemeal by purchase, between 1811 and 1822, at a cost of £6,624. Such purchases were necessary to ensure that the towers would not be closely enclosed by substantial fences and buildings that would restrict their fields of fire and hamper their military use. In 1808 part of the town works had already been blocked by houses[53] and later the towers in their turn were to be masked as land prices inflated beyond the military capacity of purchase. At Quebec and throughout British North America generally to a lesser degree, the military fought a losing battle against relentless civilian encroachments on the accepted 600-yard clear fire arc in front of works.

In 1812, however, all of the towers on the Plains of Abraham were completed well in advance of the town and armed to resist the invader, though that capacity was never used and their military value never tested. The proposed redoubt around tower 2 was not completed due to the remoteness of the war, though materials were gathered for it and the ditch excavated in 1811. At least towers 1 and 2, and presumably all four towers, were surrounded by picket fences in addition to the ditch around tower 2. These fences would have been intended for domestic security rather than active military use. All of the towers were, apparently, later provided with ditches to reduce the dangers of escalade.[54]

The four towers were not built exactly according to the dimensions laid down by Bruyeres in 1808. Their external dimensions as completed were: tower 1, 44 ft. 6 in. diameter and 29 ft. 1 in. high to the parapet; tower 2, 56 ft. diameter, and 33 ft. to the parapet; tower 3, 56 ft. diameter, and 33 ft. to the parapet; tower 4, 42 ft. 6 in. in diameter, and 26 ft. 6 in. to the parapet. All sloped inward somewhat toward the top. Thus towers 2 and 3 were identical while towers 1 and 4 showed minor variations. This pattern was carried over into other aspects of the tower construction; the structural variations between the supposedly identical towers 1 and 4 being greater than between the other supposedly identical pair. All the variations were in detail, however, as all four towers were of an essentially similar pattern. All were of sandstone ashlar masonry exterior construction with a circular exterior form and circular interior compartments within their thick rubble walls. These compartments, comprising the basement and barrack floors of the towers, were not concentric within the exterior faces of the works, but were in the English fashion offset toward the eastern face. This added to the thickness of the walls on the western side toward the plains, the only possible avenue of attack. The approximate wall proportions were 6 ft. minimum and 11 ft. maximum.[55]

Again, in emulation of the English Martello towers, the only entrance to those at Quebec was by a single door opening into the barrack level of each tower. All of the doors were on the side nearest the town works. The lower floor of each tower appears to have been ventilated by baffled air holes.[56]

The interior compartment of each tower was surmounted by a bombproof annular arch. In the Quebec towers the pillars were solid masonry and extended uniformly from the foundation to the spring of the arch. Each of the brick arches was topped by several feet of masonry to the base of the platform on top, giving a total thickness of 5 ft. of bombproofing in towers 1 and 4 and 6 ft. in towers 2 and 3. Each of the towers was also equipped with a small bombproof magazine in the basement, with an approximate capacity of 75 barrels for the smaller towers and 150 barrels for the larger. The remainder of the basement floors was unpartitioned and reserved for storage purposes. The earliest available tower plans do not indicate the presence of water storage tanks beneath the wooden basement floors of the towers. They are, however, clearly indicated in later descriptions[57] and this may well indicate a deficiency in the early plans.

The floor between the basement and barrack levels was of wood, and access to the basement was provided by a trapdoor and stairs through the floor. The basement floor itself appears to have been only about 7 ft. high, while the barrack level above was 8 ft. to the spring of the arch. Each of the barrack floors contained a fireplace venting through a chimney to the parapet,[58] and each was at one time fitted up with a tier of double wooden berths (though these were later removed) between the embrasures of the interior of their western walls. In this manner the larger towers could provide regular accommodation for 20 men, though all were intended to house larger numbers in an emergency.

Each of the four towers was pierced by two embrasures for guns or carronades at the barrack level. In both the two larger towers (2 and 3) these faced north and south directly along the axis of the tower line, while in towers 1 and 4 the embrasures were angled slightly back toward the main works. Thus none of the embrasures in the interior of the towers was designed to fire directly out upon an enemy force advancing from the west, but each was limited to a lateral or reverse fire.[59] The offensive fire role was reserved to the ordnance mounted en barbette on the top platform of the towers.

In each case access to the platform was by a stairway from the barrack level set into the thickest part of the exterior wall. The parapet of each tower was higher as well as thicker on its westward face, thus providing extra protection for the gunners on that side and rendering the platforms untenable if taken by an enemy intending to turn the ordnance against the main works. The terrepleins of the towers were not regular circles as they were in Edward's Halifax towers. At Quebec, in the English manner, the top of each tower was filled in so as just to accommodate the intended arc of the traversing platforms of the ordnance.

Towers 2 and 3 were intended for three guns and were shaped accordingly. During the War of 1812, however, tower 2 was adapted for two extra pieces of ordnance so it mounted five guns on its terreplein in addition to the two 9-pounder guns in embrasures on the barrack floor. These included one 68-pounder carronade in embrasure, two 9-pounder guns en barbette on traversing platforms and two 24-pounder guns similarily mounted. Tower 3 was armed in like fashion, except that it had no 9-pounders on top, though preparations were made for them. The two smaller towers (1 and 4) were much more lightly armed as they contained no interior ordnance and only one gun each on top. At tower 1, armed at the same time as towers 2 and 3, this ordnance was a 24-pounder gun. By December 1812 the newly completed tower 4 facing the Saint-Charles was armed with a single 18-pounder gun. On towers 1 and 4 the guns were mounted on traversing platforms en barbette and traversed a full circle from a central pivot.[60] This ordnance remained unaltered until long after the conclusion of the War of 1812.

The only strikingly unusual terreplein feature of the Quebec Martello towers was at tower 4 where a surface gallery was formed within the parapet itself, extending nearly half the way around the tower in its east and north faces. This gallery, set back 2 ft. 6 in. from the exterior of the parapet, was 3 ft. 9 in. wide with a banquette step, and offered about 5 ft. of cover on its exterior side. It was apparently designed to accommodate infantry firing in the direction of the Saint-Charles River without hampering the working of the gun at the centre of the terreplein.[61]

The Quebec Martello towers, conceived and carried to completion on the personal initiative of the military governor of Lower Canada, were to be the most English of all those constructed in Canada. There were, however, minor structural discrepancies undertaken to adapt the towers to local circumstances which the English design was never intended to meet. Their positioning was analogous to that of the English towers in that they had only a single obvious avenue of approach; this approach, however, left them exposed to a severe battering fire from stable land-based guns. Although the towers were completed, armed and equipped for service by the beginning of the War of 1812, and apparently garrisoned against a surprise attack, Craig's wisdom in ordering their construction was never put to the test of battle.

Georges Island Tower

Although neither the main permanent sea or land defences of the eastern inhabited portion of British North America was tested between 1812 and 1815, Edward's Halifax and Craig's Quebec towers were joined by another Martello tower before hostilities were more than barely under way. This last work was the Georges Island tower located on the island of the same name in Halifax harbour. While Nicolls's 1808 proposal for Halifax and Craig's Quebec towers of the same year had been prompted by fears of an American overland assault, the new Halifax tower was inspired by the worry in both England and Nova Scotia that Halifax's aging and inefficient sea defences might fall to a small American naval force in the absence of the British fleet. In that eventuality, Britain would lose at once her principal naval base in the western North Atlantic and one of her two main springboards for offensive operations against the Atlantic coast of the United States.

While the Halifax sea defence batteries were never adequate in the era of smoothbore ordnance because of the great breadth of the harbour, Georges Island was the principal bulwark of those defences and was reorganized as such.

The island had first been fortified in 1750, only a year after the founding of the town. At the end of the American Revolution its batteries mounted 48 pieces of ordnance behind decaying earthworks. Shortly after his arrival in 1794, Prince Edward, the Duke of Kent, described it as "of all situations the best for the defence of the Harbour, as it makes a formidable cross-fire, with the Batteries, both on the adjacent and opposite shores." At that time he deemed it indefensible in its existing state and resolved on erecting there a "star fort" for 300 men with a blockhouse keep in the interior. This work was accorded a high priority and completed before his departure in 1800. The fortifications were defective in every essential; there was a lot of dead ground on the island and the square wooden blockhouse provided insufficient accommodation for the intended garrison. It was these defects that gave rise to Captain Fenwick's first unsuccessful proposal to build a tower there in 1800.

In 1805 Fenwick renewed his suggestion for a strong tower to prevent the earthworks being carried by assault and the whole harbour defence jeopardized. It too was rejected. Nonetheless, the American war scare of 1807-08 emphasized the necessity for some alterations. Partial reconstruction was rejected as ineffectual, and on 4 March 1810 the Committee of Engineers in England, of which Colonel William Twiss was a member, authorized the total reformation of the earthwork and the erection of a stone tower in its centre to replace the blockhouse and substitute for the defective subterranean magazine. The armament of the new tower was intended to sweep both of the new island batteries and command the shoreline beyond. Although this plan was approved in April 1811, a labour shortage in Halifax delayed construction until the spring of 1812 when, with war in the offing, it was rushed forward. The walls were six feet high in July and it was completed and very probably armed before the end of the year.[62]

When completed, the circular tower was approximately 43 ft. in exterior diameter at the base, with a masonry exterior wall 7 ft. thick at bottom. By then it appears to have been a standardized two-storey stone tower surmounted by a terreplein and parapet. It had four cannon embrasures on the barrack floor besides being loopholed for musketry on both floors. Its bombproof arch and the masonry platform over the barrack floor were supported by a solid central brick or masonry pillar 5 ft. in diameter. The means used to enter the tower are not known, though it appears the main access was by a ground floor door on the Citadel side where the tower was presumed to be liable to covering fire from that shore if it was assaulted. Communication from ground to barrack levels was by a staircase in the wall. A brick magazine 15.3 ft. x 10.3 ft. x 5.3 ft. was built on the lower floor of the tower and pressed into immediate service to store the island's reserve ammunition. The remainder of the lower level was fitted up with a wooden banquette all round to serve the loopholes. The barrack floor above had two fireplaces for cooking and heating, and a wooden officers' room was later partitioned off on that level.[63]

In the war period each of the barrack floor embrasures was equipped with a 12-pounder carronade mounted on an oak slide. There were four 24-pounder carronades en barbette on traversing platforms. This armament appears to have been light for so important a work, but, in fact, would have been quite adequate for a tower sandwiched between two heavy sea batteries. Its principal task was to sweep the perimeter of an island only 800 feet by 500 feet.[64] The above ordnance could have performed this chore at pointblank range.

Though the tower may have been garrisoned against a surprise attack during the War of 1812, its armament found no employment. Neither did it make any structural contribution to the evolution of Martello towers, being, from all reports, a most orthodox structure. Its presence on Georges Island, however, was a classic application of the Martello tower. It combined Twiss's recommended use of them as battery keeps with the English requisite that they be exposed, if possible, only to gunfire from naval vessels. The impossibility of opening land batteries against it at a moderate range and the capacity of the island's batteries to keep ships at a distance must have made it in 1812-15 the most secure Martello tower in the British empire.

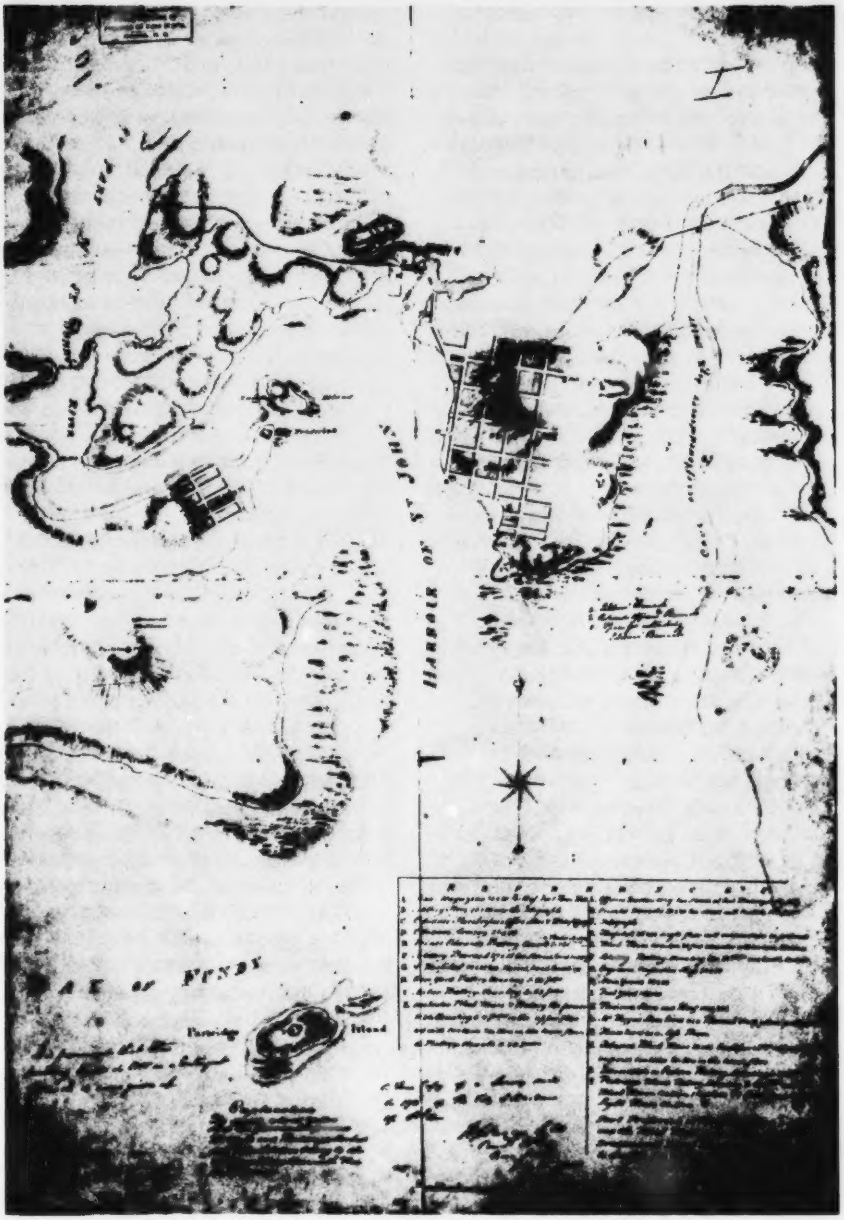
Carleton Martello Tower

The safety of the Georges Island tower was in marked contrast to that of another Martello tower erected in British North America about the same time. The Carleton tower was constructed on an isolated height of land on the west side of the harbour of Saint John, New Brunswick, between 1813 and 1815. It also was built largely on the British pattern, and circumstances were to combine to make it among the least useful of all those constructed in British North America.

The Carleton Martello tower had its origins in a survey of the New Brunswick defences executed by Captain Gustavus Nicolls, who was still Commanding Royal Engineer at Halifax in October and November 1812. At that time Halifax and most of Nova Scotia were considered immune to overland attack, barring major and unexpected reversals at sea. New Brunswick, however, was not so fortunately situated as it shared an extensive, sparsely populated and largely indefensible land frontier with the United States. Nicolls despaired of holding the interior in the face of an American overland expedition, and commended its defence to the militia and to such fieldworks as they could erect.

The city of Saint John, as the province's main entrepôt, commercial centre and chief repository of naval and military stores, fell into quite another category. Nicolls felt its hastily prepared harbour batteries were capable of defending it against such desultory raids as the Americans were likely to mount against it by sea, as it was of small overall strategic importance. Nevertheless the threat was still present, for while geography nearly precluded assault by an American military force landed by sea to the east, it was subject to a land attack from the west either from troops landed on the nearby coast or coming overland via the St. Andrews road. Thus any military expedition against Saint John would bring an enemy to the same point, the town of Carleton on the western shore of the harbour opposite Saint John. From this point the city could be safely bombarded.

3 Plan of Saint John, N.B., 1814, showing Carleton tower and other defence works. *(Public Archives of Canada.)*



Consequently the heights in the rear of the town constituted a position of some considerable military significance. The position was also potentially strong, flanked on the right by the Saint John River and on the left by the Bay of Fundy. In November 1812 Nicolls proposed defending it with a chain of four redoubts, adding, "I . . . think the importance of the situation merits a Stone Tower in addition." Although this proposal was generally approved by the War Office, the exigencies of war precluded its completion, and in the end only the Martello tower was built. By the summer of 1815 it and the Drummond blockhouse, erected on a height 200 yards to the south in 1812, formed the only defence for the western land approaches to the city.[65]

A plan for the Carleton tower had been drawn in Halifax by March 1813 and, given the prevailing military emergency, it seems safe to assume that construction began early in the working season of that year. It was undertaken as a field work under the authority of Sir John Sherbrooke, the commander of the forces in Nova Scotia. Though the New Brunswick assembly voted funds for some of the wartime Saint John fortifications, the tower was erected entirely at the expense of the British treasury.[66]

The tower was still incomplete at the end of 1814. Delays had been occasioned by a shortage of materials and probably also by a shortage of workmen, owing to a wartime boom economy. Some military labour was employed, but it was still necessary to hire skilled workmen at exorbitant rates of pay. In the winter of 1814-15 the gathering of materials continued under the direction of Captain Walker, who had replaced MacLauchlan as superintendent of the tower, and it was apparently completed about mid-1815.[67]

This structure was a typical Martello tower, 50 ft. in exterior diameter and 30 ft. high with a tapering rubble masonry exterior wall 6 ft. thick all round at the parapet. The 2 ft. 8 in. thick bombproof brick arch above the upper, or barrack, floor of the two-storey tower was supported at the centre by a masonry pillar with a small chute in the centre suitable for the passage of ammunition. The pillar was squared in the basement but rounded and 5 ft. in diameter above, extending from the foundation to the spring of the arch. The tower was filled with rubble between the top of the arch and the level of the masonry terreplein. The latter was surrounded by a five-foot parapet en barbette. The tower had two embrasures on the barrack level and was loopholed for musketry in the basement wall. The only entrance to the completed tower was through a door on the upper level. The barrack floor was of wood, and the basement, reached by stairs and a hatchway through the wooden floor, contained a bombproof arched brick magazine and a peripheral wooden banquette step for the service of the loopholes. The barrack level had a fireplace recessed in the exterior wall for heating and cooking. Access to the top of the tower was by a narrow winding staircase cut into the exterior wall, which was thickened at that point to accommodate the passage without loss of strength.[68]

The Carleton tower was originally intended to mount two 24-pounder guns on traversing platforms and two 24-pounder carronades on traversing slides on top, but the end of the war obviated the necessity for its armament. Some locally available ordnance may have been supplied after the war, but it was almost certainly not mounted.[69] The original specification for heavy gun ordnance is indicative of the magnitude of the tower's intended role; on one flank, for instance, it was intended to cover the sloping ground all the way to the Fundy shore, 1,200 yards distant.

While this tower is architecturally representative of the concentric circular construction and hollow central pillar seemingly much favoured in Halifax, its contemporary military virtues were much more circumscribed. In the light of Nicolls's 1808 Halifax proposals, it is easy to understand his 1812 recommendation for a stone tower on Carleton Heights, particularly as he conceived it as an adjunct to a heavy fortified line. It is much more difficult to discover the military rationale for its solitary construction there, as it was completely exposed and highly vulnerable to a land-based artillery bombardment. The reasons, perhaps, can be discerned more readily in the political needs of the governmental establishment to give the appearance of military interest and industry to a populace that had a hostile power established on its own immediate frontier. While the fate of Saint John, and in fact the province of New Brunswick as a whole, was of small intrinsic consequence in the military councils at Halifax, the province was the principal military bulwark of Nova Scotia, and its utility in delaying an attacker depended largely on the loyalty and enthusiasm of its populace. It appears to have been felt in Halifax that both this support and some cursory measure of military protection for Saint John could be purchased at moderate cost in the form of the ostentatious Carleton Martello tower. In the circumstances it was fortunate to have been brought to completion after the end of the war.

Sherbrooke Tower

Another, less fortunate, contemporary was the Sherbrooke Martello tower in Halifax where, in 1816, work on the half-built tower was halted by the general prohibition on further construction of fieldworks that followed in the wake of peace in Europe.[70] Sherbrooke Tower was the last Martello tower constructed in the Maritime provinces. It was begun in 1814, largely on the whim of Lieutenant General Sir John Sherbrooke, lieutenant governor of Nova Scotia and the commander of the forces in the Maritimes. In 1812 Sherbrooke proposed that a tower be located on the seaward extremity of Maugher Beach, a low-lying wind-and water-swept shingle on McNab Island opposite York Redoubt. He felt it would contribute materially to the Halifax defences "In taking up shipping before the Battery at York Redoubt and bringing a fire on those parts of [the harbour] entrance under the high cliff on the Eastern Shore, not seen into by the guns from that Battery," although it was later determined that smoothbore guns so mounted had never been adequate to span this 1,764-yard-wide channel. In 1813, Gustavus Nicolls, who was instructed to prepare a supplementary estimate for the tower, did not much approve of it, and consequently couched his recommendation in such terms as to ensure Board of Ordnance rejection for 1813 at least. Sherbrooke persevered, however, and construction began in 1814.[71]

Work on the tower proceeded very slowly due to faulty estimates, the inaccessibility of the site and the difficulty of procuring and transporting materials. There was no suitable stone on McNab Island and the tower was built of granite quarried on the Northwest Arm. Only the foundation (masonry on a base of hemlock logs) was completed in 1814. In 1815 little was accomplished, as Lieutenant Colonel Wright, the new commanding Royal Engineer, insisted on suggesting revisions of the approved plan and waiting on a reply. His suggestions, involving the use of counterarches to strengthen the foundation of the tower and the building of the whole work in close-pointed ashlar (rather than rubble) masonry, were eventually to be incorporated into the finished structure. At 1815 prices his additions added another £1,998 to the already expensive tower. In 1816, difficulties of transporting the granite to the site and the failure of the specified Harwich cement to arrive from England resulted in the wall of the tower having only been carried up 8 ft. when the stop-work order arrived from England. This partial wall was subsequently covered over to await the revival of the project which did not come until 1827.[72]

Both Nicolls and Wright visualized an essentially similar structure. It was to be a two-storey bombproof Martello tower fitted on top for four heavy guns en barbette. This was the basic design carried out in 1828 on the same foundation. When finished it was a circular tower 50 ft. in external diameter and about 30 ft. high with a wall 7 ft. 6 in. thick at the base, diminishing to 5 ft. 4 in. at the parapet. A solid circular central pillar supported a 2 ft. 6 in. bombproof arch above the barrack floor.[73]

When the Sherbrooke tower was finally completed, more than a decade after its inception, it was immediately pressed into primary service as a lighthouse, and one cannot but feel that it was of greatest use in that capacity. Functionally it was never capable of performing the duties of a small self-defensible sea battery as envisioned by Sir John Sherbrooke. Even with a maximum armament the weight and range of its fire would not have halted or severely hindered the passage of a vessel up the main channel, which was a mile wide at that point, although it would have been difficult for an enemy naval force to have eliminated the work itself. Its only salutory effect would have been to deny an enemy naval force use of the sheltered anchorage nearby, and at that it would hardly have seemed to repay the cost of construction and maintenance.

A detailed examination of the inception, construction, and function of the early British North American Martello towers does not yield a satisfactory universal principle of their design and tactical employment. It is immediately obvious that none of the Duke of Kent's Halifax towers originally fitted the architectural definition of a Martello tower as it came to be understood, and that only one of them, the Prince of Wales Tower, was subsequently sufficiently altered by bombproofing to bring it within reach of the narrow functional definition of such structures. The other seven towers built after 1808 were erected within quite narrow structural parameters. All were two-storey self-defensible, bombproof, arched, masonry gun platforms, embrasured on the barrack level and mounting ordnance en barbette on the terreplein above. All approximated the general dimensions of a 50 ft. basal diameter, 30 ft. high scarp wall, and 7 ft. thick wall. Six of the seven incorporated a solitary elevated entrance opening onto the second floor. Although there were numerous minor structural divergences from tower to tower and between those in the Maritime provinces and those at Quebec, many, it seems, were simply products of chance or the adaptation of a particular tower to peculiar local circumstances. The remainder may be accounted for by the personal predilections of the two Royal Engineer officers involved in the planning or construction of all of them, Bruyeres at Quebec and Gustavus Nicolls in the Maritimes.

This last factor would seem to explain the adherence, at Halifax and Saint John, to a pattern of towers with an exterior face concentric with its interior compartment and a fully circular terreplein; while the Quebec towers had, in emulation of their British counterparts, been constructed with an interior compartment offset within the outer wall and the terreplein shaped to the traverse of the ordnance.

While there is an architectural discontinuity between Edward's and the post-1808 towers built in the English pattern, all ten Canadian towers find a negative unity in the discordant strands that governed their tactical employment, in almost universal violation of their accepted uses in England. Eight of the ten early British American towers were constructed in positions where they could be subjected to some measure of relatively accurate land-based artillery fire. In every instance the towers seem to have been taken up as a cheap and expedient means of resolving some local defence problem without regard for their weaknesses or the broader principles of their employment. As it is improbable that the engineer officers, or at least their masters on the Board of Ordnance, were unaware of the effects of gunfire on the walls or mortar fire on the exposed terrepleins and gun mountings of such masonry structures, it is necessary to seek elsewhere for reasons for their widespread use in exposed positions.

It would appear, on analysis, that Martello towers were so readily embraced because, in almost every instance of their use, they were more economical of men and money, more durable, and more immediately impressive and useful than their alternatives, rather than from any necessary intrinsic military value they might have. Martello towers were the logical military successors of wooden blockhouses in the dawning age of heavier and better guns and superior powder. In terms of good earthen redoubts, the logical alternative means of fortifying the positions they defended, their military superiority from surprise and escalade, cannot be ignored, but on the whole it was non-military factors that governed the choice of towers in most instances. The influences of fads and politics, together with superficial military attractiveness and a desire for permanent works within the British service, all contributed to their erection without a particular regard for or understanding of their military capacities and limitations.

Between 1796 and 1815, Martello towers were the only economical means of widespread permanent fortifications available to English engineers. In the evolution of British North American patterns of fortification they can be seen to mark a transitional phase between the wooden blockhouses and sodded earthworks of the 18th century and the heavily casemated, massive and expensive masonry fortresses and redoubts of the 19th century. Martello towers fairly quickly outlived whatever military utility they might have had, although the tremendous costs of alternative means of defence led to their continued acceptance for many years. The years before the War of 1812, however, marked the high point of the popularity and usefulness of Martello towers, and witnessed the progressive standardization of a design of light permanent work that in 1796 had been only a vaguely understood expedient in the colonial outport of Halifax.

While one may speculate about the reasons surrounding the widespread choice of Martello towers as a type of fortification, the needs prompting the choice are quite simple. Prince Edward's towers were a direct response to a French naval threat in the western North Atlantic, while all of the others, both proposed and actually built, came about as a direct result of the warlike stance of the United States in 1807 and thereafter. The more immediate and severe nature of the American danger placed a premium on permanent works that could be quickly defended against a surprise attack by the full weight of the American armed forces. The danger from the French had never extended beyond a naval squadron cruising the British North American coastline in summer. The Americans, however, inferior at sea and with a single landward direction for their aggression, provided British North America with a much more serious, enduring and undivided impediment to its continued separate existence. This basic threat was magnified by the long common frontier and the assumed capacity, real or imagined, of the American backwoods armies to move quickly and in all seasons of the year in a manner that a European force could not emulate. The ephemeral French threat and the growing American danger had together produced a number of Martello towers by 1815. The continuing American threat was to condition their adaptation and maintenance, the proposal of many and the construction of a few others, before the permanent fortification of the interior of British North America was effectively abandoned 33 years later.

Stasis and Neglect: 1815-45

The history of Martello towers in British North America during the 30-year peace between 1815 and the Anglo-American Oregon crisis of 1845 is marked by two main themes: numerous proposals to build more towers and neglect of the existing ones. Although throughout this whole period none was commenced and only the Sherbrooke tower at Halifax was completed, their frequent proposal is illustrative of the quandary of the Colonial Office and British military strategists. The British found themselves firmly committed to the defence of a vast developing inland area where the range and expense of necessary fortifications was magnified by every survey of the subject. They lacked the financial means and, perhaps, any real desire to make thorough preparations for war in an era of peace. In these circumstances they fell back on the expedient of preparing many fortification proposals, building few works, and for the most part trusting the defence of the British American colonies to naval supremacy, successful diplomacy, and such scattered existing works as had survived the earlier age of war. Martello towers, because of their durability, were a major constituent of that defensive pragmatism.

Although some of the existing towers were of questionable military value and none had been put to the test of action before 1815, the British government found it possible to maintain them in active service during the three decades that followed because of the almost total stasis in the development of ordnance and other offensive military technology throughout that period. All eight of the towers completed by 1812 had been armed and prepared for action, and a number of them had been garrisoned for the duration of the War of 1812. None of the towers was deliberately disarmed with the coming of peace, but neither was the Carleton Tower prepared for war. In every instance a process of uncorrected deterioration and decay set in immediately on the towers. This process was destructive of buildings, everywhere subject to heavy frosts, and, in seaside locations, to the devastating effects of salt air. The ongoing process of decay of the towers was almost everywhere assisted by their unsuitablity as military barracks. Basically, they were too cold and damp, and in some cases too remote, to be turned into adequate permanent quarters. The consequent general lack of winter heat accelerated the deterioration of the masonry while dampness rotted the wooden fittings.

These natural processes were speeded up by the lethargy and time-consuming administrative procedures that characterized the Ordnance Department, which was exclusively charged with their overall maintenance and carrying out even the most minor repairs on them. With the coming of peace the abundant source of contingency funds, formerly available through the military chest and at the disposal of the commander of the forces, dried up. Thereafter, every repair item, even those as minor as replacing window sashes and fixing door locks, had to be submitted to England for approval of the Board of Ordnance and inclusion in the Ordnance annual estimate for the following year. While this may have been a sound and perhaps inevitable accounting procedure, it was conducive to great delay and often, in that period of fiscal parsimony, outright rejection year after year. Small tower repairs, such as broken windows and shutters, were often not authorized until several years' entry of moisture had badly rotted the interior woodwork. The whole maintenance process was sometimes complicated further by the fact that several military agencies shared partial responsibility for parts of the tower. The engineers were charged with the task of overall repair of the towers but the Royal Artillery, the other Board of Ordnance entity, was responsible for the care of the ordnance and mountings and for the magazine, if it contained powder. At the same time the Quartermaster General's department, a part of the regular military establishment reporting to the War Office, controlled the empty magazines and other storage facilities. On the other hand the Barrack Department, another Horse Guards' subsection, was in charge of the barrack levels of the towers. The important chore of airing the towers in fine weather to prevent mildew and rot appears to have been a much disputed and badly performed joint responsibility of the Quartermaster and Barrack departments. All of these separate and badly coordinated bodies were under some measure of authority from the local military commander.[1] The consequence of this ponderous military machinery was that the Martello towers, although they required little repair and maintenance, received even less.

By about 1821 most of the gunpowder and warlike stores had been removed from the towers because of their lack of security and the dampness of their poorly ventilated magazines. By that date, also, the terreplein ordnance of the towers began to be dismounted and the platforms and carriages stored within to preserve them from the worst effects of the elements. Despite a local general order at Halifax in the late 1820s to keep all the defences armed for immediate action, this process continued until, by 1834, there was hardly a piece of mounted ordnance on any of the towers in British North America. In 1821 only the two 24-pounder guns remained mounted on the Prince of Wales Tower; at Georges Island the tower retained only its four 24-pounder carronades on top. The lack of a coordinated policy is illustrated by the fact that the Carleton tower remained unarmed after 1815 while guns were mounted on the Sherbrooke tower on its completion in 1828. At Quebec the only pieces in place were the two 9-pounder guns within each of towers 2 and 3. This however, was not as serious a disadvantage as it might seem, as most of the guns and carronades could be remounted in very short order, although few towers were prepared to resist a surprise attack.[2]

The deleterious effects of moisture on the artillery equipment and the terreplein and parapet masonry of the towers, and of seepage within, were diminished by the provision of conical snow roofs for all of the towers after 1823. These roofs, supported by the tower either at its centre or periphery, were generally so contrived as to permit some limited firing of the guns while they were in place. They were, however, intended to be removed in any serious crisis. The roofs of the Maritime towers appear to have been cedar shingled while those on the Quebec towers were later covered with sheet iron as fireproofing. The first use of a shingled roof was on the partially completed Sherbrooke tower in 1818. This covering was perpetuated after its completion in 1827 by the wood-roofed light room then erected upon it. A regular snow roof was ordered for the Carleton tower in 1822 and for the Prince of Wales tower by 1824. The Georges Island, Fort Clarence and Quebec towers were covered about the same time. Only the York Redoubt tower was not provided with a regulation snow roof: it did not require one, as its overhanging wooden terreplein served to some extent to keep moisture off it. This *de facto* roof, last replaced in 1809, was renewed about 1824 after frequent complaints of its leaking.[3]

The York Redoubt and Sherbrooke towers were probably the best maintained of all these early works. In the latter case this was due to its regular occupancy by a lightkeeper after its completion, and in the former, because it provided regular quarters for the men of the military signal establishment operated from York Redoubt. This tower was a link in the chain of signal stations down the harbour from Camperdown to Citadel Hill.[4] The most the others could hope for was the irregular services of a caretaker.

While the masonry exterior walls of the towers were very enduring and appear, in most cases, to have been repointed often enough to prevent serious damage being done, a great problem had developed with the Quebec towers as early as 1823. Their walls had been constructed with ashlar masonry exterior facings over rubble or brickwork. By that date the facings, which had been constructed without regular headers and stretchers properly bedded, were so bulged in places that they appeared ready to fall down. This problem was not immediately corrected and in 1825 it was reported that the towers

were built originally without a sufficient slope or batter, and the rain having penetrated thro' the surface of the parapet, the severe frosts and subsequent thaws of this climate have caused a good deal of the outer stone work to peel off.[5]

This problem was subsequently corrected although at least one of the Halifax towers was later allowed to deteriorate to a similar extent.[6]

All of the completed towers appear to have run a slowly deteriorating course until the new military crisis of 1845-46. At that time the Ordnance reassessed their military condition and some of their guns and carronades appear to have been remounted in anticipation of active service. The Oregon crisis dissipated altogether too quickly, however, to allow an excuse for their general repair, and by the late 1840s most of them were still in an unimproved and unserviceable state, with decayed gun carriages and floors and rotten door and window fittings that exposed the interior to the elements.[7] Although the towers remained active components of the British defensive system after 1845, most of them were never refurbished or adapted to meet the new conditions of warfare then emerging, and were accorded only such routine maintenance as was necessary to maintain them while their ultimate fate was decided by the War Office. It is difficult to assess the level of unwarranted neglect of the towers in this period. To some extent their original popularity had depended on their capacity to be shut up and abandoned to await the next war. Most of them were certainly badly maintained by a government preoccupied with massive fortifications but none ever appears to have been completely unusable in an emergency.

While the existing Martello towers were perhaps being maintained in a more slipshod manner than was intended even by the men who built them, proposals for many others were being brought forward to meet the defensive needs of the British North American provinces. This process began immediately after the coming of peace in 1815 and was perpetuated in the Smyth report of 1825 and the subsequent committees, commissions and surveys that sought some manageable means of solving the dilemma of British North American defence.

The first post-war Martello tower proposal came, not entirely surprisingly, from Sir John Sherbrooke. Sherbrooke had been a devotee of towers while in Halifax and by 1816 had been moved on to Canada to become governor general. In July of that year he ordered a report on Canadian fortifications. This document, forwarded to England in December, recommended the construction of a number of towers at Kingston to be used as battery keeps and outworks to the existing Fort Henry. Sherbrooke's report was not implemented, but some of its themes were taken up in 1818 by the Duke of Richmond, the Secretary for War, and influenced the views of the Duke of Wellington, the newly appointed Master General of Ordnance. Wellington in turn exerted a vital formative influence on the deliberations of the Smyth Commission of 1825.[8] This commission and the succeeding committees of engineers which met over the next few years to refine the Smyth report and determine the order of its implementation, together constitute the most important departure in British North American strategic and fortification thought in the first half of the 19th century.

The Smyth report and its proposed extended use of Martello towers was antedated by a number of *ad hoc* local defensive proposals and works, which were one of the contributory factors to the report being commissioned. Among them were: the long mooted Quebec Citadel, which was begun about 1820 to secure access to the Canadas; Fort Lennox on the Richelieu, taken under consideration about the same time; the search for a secure alternate water route from Montreal to the Great Lakes; and, in the Maritimes, an 1824 proposal by James Arnold, the commanding Royal Engineer, to construct a number of towers to defend the naval dockyard at Halifax. The anticipated cost of such works helped precipitate Sir James Carmichael Smyth's review of the overall defensive needs of the colonies. Arnold's proposal serves as an example of the pressure for new defences operating upon the British government. The cost of Arnold's proposal was not stated but it must have been substantial. It was essentially an amalgam of those earlier proposed by Fenwick, MacLauchlan and Nicolls. Its key was the provision of two towers for Citadel Hill, two towers for Needham's Hill and a line of towers across the peninsula. It also took cognizance of the earlier suggestions for a range of towers on the Dartmouth side, although in view of General Mann's dictum for economy and his predilection for confining permanent works to the defence of the harbour, dockyard and town of Halifax, he did not press the issue. Finally he urged the completion of the tower on Mauger Beach.[9] All of his suggestions except the last were stillborn in the wake of the 1825 reassessment of British North American defence.

Awakened to the prospect of some future military disaster and prompted by the necessity of piecemeal and heavy future expenditures on an antiquated defensive system largely neglected for a decade, the Duke of Wellington, Master General of the Board of Ordnance, ordered a thorough examination of existing and necessary defences of the British North American provinces early in 1825. A commission of three under the chairmanship of Major General Sir James Carmichael Smyth, R. E., toured the provinces and made its report later that year. The commission found most of the old works in ruins and determined that, although the Canadas shared a 900-mile military frontier with the United States, the Americans had only three worthwhile avenues of approach. These were by the Richelieu route against Montreal and Quebec, across Lake Ontario to Kingston, and against the Niagara frontier. Rather than reconstruct most of the old scattered decayed works to meet an attack along these avenues, the commission proposed an essential consolidation of the garrisons within a few strongly fortified points strategically located to check an American advance along the likely avenues of assault. In conjunction with this strategy they proposed to leave much of the intervening area to the command of a disposable field force. While the commission found it could not recommend elimination of all the minor points, it proposed defending them mainly with towers of one sort or other. This whole defensive system was to be sustained by good water communications withdrawn as far as possible from the American frontier.

The strategy proposed by the commission was quite simple. It surmised that, because of the opening up of the surrounding country, Fort Lennox on the Richelieu could be by-passed. The members believed, however, that with the defence of St. John's and Chambly, it would make the Richelieu an untenable avenue of approach to Quebec, the final object of any assault. Assuming that an enemy could be turned against Montreal first they contemplated its defence by a citadel on Mont Royal supported by outworks at the mouth of the Châteauguay River and Ile-Sainte-Hélène. The commission generally favoured the use of large masonry barrack towers costing £50,000 each, like Fort Wellington near Ostend in The Netherlands. Two of the works, however, were to be Martello towers at a cost of £5,000 each.

At Kingston the Smyth Commission proposed to improve Fort Henry greatly, repair the existing batteries and erect three Martello towers, one on each of Cedar and Snake islands and one in advance of Fort Henry. To the west of Kingston they proposed a major fortress on the Niagara frontier sustained to the south and west by four redoubted Wellington towers and three Martello towers. One of the latter was to be at the mouth of the Thames River, and one at each end of Bois Blanc Island. At Quebec the commission urged the completion of the citadel, which was then only one-third finished, general improvement of the town works and preparations for a defensive fieldwork line utilizing the Martello towers, and a new Martello tower on the right bank of the Saint-Charles River.

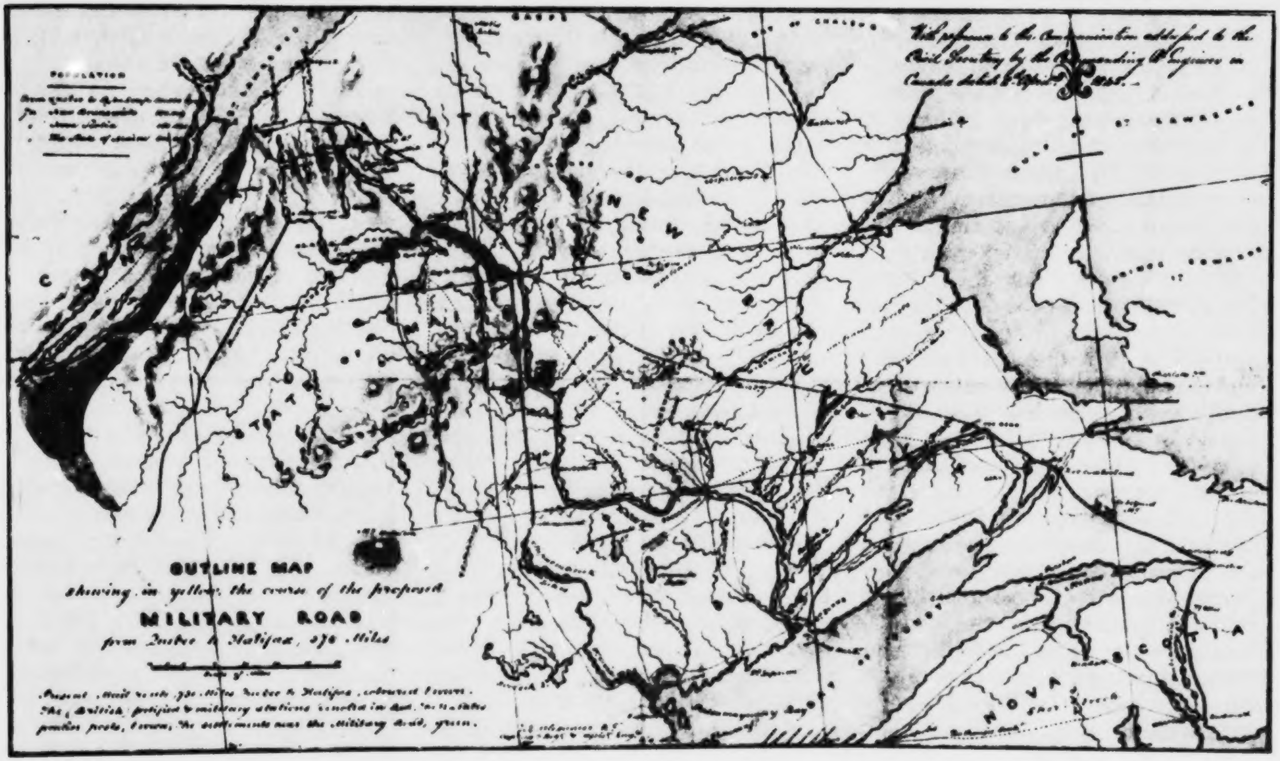
In the Maritimes, in essence, the commission proposed a road from Rivière-du-Loup to Fredericton to facilitate communication between the Canadas and Nova Scotia, a work at Fredericton on which to rally the militia, a strong tower to reinforce a heavier battery at Partridge Island, and erection of a citadel at Halifax and improvement of its sea defences to prevent a *coup de main*. The suggested Halifax works included completion of the Sherbrooke tower on Mauger Beach.

The whole projected cost of the commission's scheme, including the Rideau Canal, the New Brunswick road and the fortifications, reached the very high sum of £1,646,218. Although work soon commenced on the canal, the Halifax Citadel and the casemated redoubt at Fort Henry, and work on the Quebec Citadel pushed to completion, their financial requirements exhausted most of the available funds. The remaining proposals were refined and redefined over the next two decades, but little or nothing was accomplished beyond the preparation of elaborate plans and the completion of a few surveys.[10]

The Smyth Commission did not rely overmuch on Martello towers in the new defensive system, preferring instead the more commodious and less assailable Wellington towers. It did, however, appear freely to advocate their use when necessary, and to favour them in circumstances where a cheap, durable light permanent work was required to delay and hamper an enemy briefly rather than to stop him for a protracted period.

Although a number of Martello towers were later erected at Kingston, the only one of the many suggested in 1825 that was completed as proposed was the Sherbrooke tower in Halifax. The commission suggested that "as a further defence contributing equally to the Security of the Harbour, and to impede any attempt at a 'coup de main' or surprise by the North West Arm, that Sherbrooke's tower, commenced upon the Mauger Rocks, should be completed."[11] Another important impetus to finish this Mar-

Map of the Province of New Brunswick, 1845, showing the course of the proposed military road surveyed in that year. *(Public Archives of Canada.)*


OUTLINE MAP
showing in yellow the course of the proposed
MILITARY ROAD
from Quebec to Halifax, 370 Miles
NEW
NOVA SCOTIA

tello tower came in 1826 when the provincial legislature voted £1,500 to erect a lighthouse on the beach. Gustavus Nicolls, again Commanding Royal Engineer at Halifax, suggested that it would be both necessary and inexpedient for the province to erect such a building if the tower were completed. In such an instance the lighthouse would effectively mask the fire of the tower. On the other hand, the tower was too isolated to become a permanent barracks, and peacetime storage facilities and accommodation for a lightkeeper could be supplied without loss to the military.[12] His suggestion was submitted to the Board of Ordnance in June and received its approval in July 1826. The tower, which was eight feet high at that point, was virtually complete by November 1827, though the lighthouse was not in operation until April 1828. The intended platform armament of three 24-pounder guns was put in place in 1827 before the wooden lighthouse superstructure was placed on top of the tower. This light room caused almost no compromise in the military design as it was balanced on a single masonry kingpost rising from the centre of the platform. The umbrella effect of this arrangement permitted the unrestricted traversing of the guns.[13] Part of the interior of the tower was given over to the purposes of the light. The four 24-pounder carronades for the barrack level were not mounted, although they were placed in the tower.[14]

The fact that only the Sherbrooke tower was completed out of all those recommended by the Smyth Commission did not prevent plans being drawn for others of those proposed and the later projection of many more. The first of these was the revised Partridge Island battery and tower plan called for by the Inspector General's office in July 1826. Captain Graydon, the Royal Engineer officer in New Brunswick, proposed a heavy battery for each end of this small island at the entrance to Saint John harbour. The batteries were to be enclosed by a continuous parapet encompassing the whole upper part of the island. He was of the opinion that such a work would make both harbour entrance channels impassable in most circumstances. He further recommended a respectable tower midway between the batteries to sweep them if they were taken by assault and to serve as a bombproof barrack with storerooms sufficient to contain supplies for a long siege. In its general features this proposed defence was very similar to that of Georges Island. Both islands were difficult of assault and offered an all-round perimeter defence of a position primarily subject only to naval gunfire. This met the ideal conditions for the employment of a Martello tower.

While neither tower nor batteries were constructed, a brief examination of the tower's specifications and features allows an assessment of the state of the tower building art in 1826. It was intended to be a two-storey bombproof arched building with caponiers communicating with each of the batteries. It was estimated that it would cost £5,780. It was to be composed of one-third dressed masonry, to be used in making the exterior of the wall, stairs, central pier and the crest of the parapet. The remainder was to be of rough or rubble masonry with brick arches and chimneys. Its woodwork and roof were to be of spruce scantling with pine covering the floors. The same kind of wood was to be used in the door and window fittings. The doors themselves were to be of oak and the snow roof covered with cedar shingles. The tower was to be heavily armed, with two 24-pounder guns on traversing platforms and two 8-inch mortars on top and eight 24-pounder carronades in the upper storey. This ordnance (including the only proposed use of mortars on Canadian Martello towers), Graydon felt, would prevent an enemy holding either battery if he should obtain it by a sudden attack.[15]

The above proposal was hardly an isolated example. In 1827 Colonel Nicolls recommended the construction of a number of towers. These included several for the defence of St. John's, Newfoundland, and one each for Needham's Hill in Halifax and Fort Edward, Windsor. The detailed plan for the Needham's Hill tower was drawn and approved by Major General Smyth. In New Brunswick two more towers were later proposed for the defence of Saint John against a surprise attack. In Canada plans were drawn for two 2-gun Martello towers, one for each end of Bois Blanc Island. They were on the pattern of the one proposed for Snake Island, Kingston. Although the Snake Island tower was never constructed, there was a proliferation of the works proposed for Kingston in the years 1825-29. The Smyth Commission recommendation had been deemed inadequate for so important a point. By October 1829 a new defence plan had been approved by the Board of Ordnance in an attempt to provide an all-round defence by a system of works encompassing a new Fort Henry, a series of redoubts and batteries and six Martello towers. These towers were not constructed as planned due to a lack of funds and the natural precedence of the main work at Fort Henry. While the towers were not built they remained an integral component of the defensive system and revised plans of some of them were ordered in 1839 and 1840.[16] These persistent tower proposals emphasized the assumed continuing military utility of Martello towers, both among senior officers of the Board of Ordnance and engineer officers in British North America, at a time when their general use was becoming the subject of criticism in Great Britain.

The question remains, however, whether the espousal of towers was primarily a military or political counter in the interminable debate on British North American defences. The Duke of Wellington had delineated the problem in March, 1819, while founding a hope of its solution on the securing of an alternative means of inland communication further removed from the American frontier than the St. Lawrence River. His dictum was stated in the instructions to the Smyth Commission, in which it was pointed out that:

It is quite obvious that if the Lines of communication proposed by the Master General . . . for your consideration and report cannot be carried into execution, or some other distinct from the St. Lawrence discovered, the defence of those distant Provinces will become so difficult as to be almost impossible.[17]

His views were reiterated in a letter to Lord Bathurst, the Secretary for War, after receipt of the completed report at the end of 1825. Arguing that British honour would prevent a withdrawal from Canada, he gave it as his belief that if the communications line were built it could be defended by means of fortifications. He further noted that if the works were not constructed the loyalty of the populace would be lost to the United States.

Even by the greatest exertion of the military resources of His Majesty's Government in time of war, these dominions could not be successfully and effectually defended, without the adoption of the greatest part of the measures proposed; but if they are all adopted, and attention is paid to the militia laws of these countries and care taken to keep alive a military spirit among the population, the defence of these Dominions ought not to be a more severe burden upon the military resources of the empire in war, than such defence as was made proved to be during the late war.[18]

None of these reviews challenged the essential defensibility of the Maritime Provinces in the hands of the Royal Navy. By 1828 the defence of the Canadas by a line of works and communications erected on a Quebec City-Kingston-Short Hills-Lake Erie axis was firmly accepted into British military orthodoxy and its prime essential, the Rideau Canal system, was already under construction. In that year Major General Smyth elaborated his views on the necessity of permanent fortifications and established a rough equation between their completion and the number of regular troops required for the defence of the country, and as well for the effective use that could be made of the militia. He argued that the substitution of a few judiciously placed and defensible works for the many small posts formerly scattered along the frontier would provide more effective rallying points for the militia. The locations for the new works had been selected with this view in mind and Smyth felt it was a very important one, as he placed small value on the militia in an offensive capacity, although he felt it praiseworthy if used in a static defensive role. By careful employment of the militia, primarily in strong permanent works, he felt that the necessary wartime strength of British regulars could be reduced to 5,000 infantry, a regiment of cavalry and two brigades of field guns, in addition to the troops required in the Maritimes. This he opposed to the currently estimated necessary strength of 13,050.

In Smyth's view his plan would ease the sudden heavy manpower burden on the empire at war, effect a real economy and improve the chance of success with works properly constructed in the leisure of peace. Smyth certainly felt that permanency was the overriding consideration and in 1827 he lamented how little of a permanent nature had been accomplished at Halifax since Morse's report to Sir Guy Carleton in 1783.[19]

Despite Smyth's cogent arguments for the construction of permanent fortifications, the financial resources and sense of urgency necessary to carry the system to completion were lacking. Work was initiated on a continuing basis on the major fortresses at Halifax, Quebec and Kingston but beyond that nothing of importance was actually completed before 1840, when Lord John Russell, the Colonial Secretary, ordered most of the works contemplated by the commission of 1825 deferred for future consideration.[20]

Russell's action appears to have been prompted by the fact that the Smyth recommendations were by then 15 years out of date, and that the effective and irreparable loss of naval supremacy on most of the Great Lakes might have permanently altered the conditions and theatres of war in British North America. By 1840 it was evident to Sir Richard Jackson that the command even of Lake Ontario depended on the British capacity to hold Kingston with its harbour and dockyard facilities.[21] It appears that there might have been a general, if unvoiced, suspicion that nothing to the west of Kingston was permanently and assuredly defensible in any event.

In 1840 Russell's doubts and the unsettled state of Anglo-American relations produced a thoroughgoing reassessment of Canadian defences. The opinions of officers in the British American provinces were canvassed through the intermediary of the Governor General, and the whole correspondence returned to Britain, it produced a reiteration of the familiar arguments but yielded no definite general conclusions as to the desirability or extent of permanent fortifications. On 18 February 1841, the Ordnance Office was moved to recommend that for the present, at least, "It would be advisable to confine ourselves to carrying out the fortifications at Kingston and Quebec, as proposed by the Inspector General."[22] Even this was not done to the full expected extent and the resolution of the whole question awaited a pragmatic solution induced by the appearance of another Anglo-American crisis.

The reports and memoranda of 1840-41 do, however, indicate that Lieutenant Colonel Oldfield and his superiors in the Board of Ordnance accorded a continuing and extensive role to Martello towers. In March 1840, Oldfield proposed that six round stone towers be built in a half-circle in the rear of Montreal for its defence,[23] and plans for the defence of Ile-Sainte-Hélène by towers were being forwarded to Britain as late as January 1847.[24] Oldfield's 1840 survey of desirable fortifications was drawn up in reference to the suggestions of the Smyth Commission of 1825 and included the tower for the left bank of the Saint-Charles, first suggested in 1808; the six Kingston towers recommended by the committee of 1829; a Martello tower for Chippawa and two for Bois Blanc Island; another Martello tower as a bastion keep for the fort at St. John's, Lower Canada; and numerous other similar structures.[25] While none of these towers was ever constructed exactly as planned or suggested, and only the Kingston towers were ever built at all, their continuing military acceptability as a viable pattern of fortification is again clearly illustrated.

Further corroboration of the proposed use and continuing popularity of round stone towers can be derived from Newfoundland, where, in 1841, Sir John Harvey, the lieutenant governor, revived Gustavus Nicolls's 1827 suggestion and proposed a semi-circular series of eight such towers for the land defence of St. John's harbour. His suggestion was rejected out of hand from its unreasonable and unwarranted expense.[26]

While factors contributing to the eventual construction of the Kingston Martello towers can be discerned in almost every facet of the long British North American defence controversy extending from 1816 to 1845, little of specific structural or functional consequence can be ascertained from their often-suggested use, because none was commenced and most were not even carried over into detailed plans. They were projected in a wide variety of circumstances ranging from a keep to the inaccessible sea batteries on Partridge Island to semicircular, mutually supporting arcs of land defence in the rear of Montreal and St. John's, Newfoundland. Their more common projected role, however, was as an expedient means of defending exposed and isolated points, as at Chippawa, "by posts, which although not calculated to withstand a protracted siege, may be sufficiently respectable to oblige an enemy to bring up his artillery, and thereby afford time for our troops and militia to assemble for their support."[27] Martello towers with their high, thick scarp walls were ideally adapted to resist surprise and escalade and to force their reduction by artillery. By 1846, Colonel Holloway, Oldfield's successor as commanding Royal Engineer in Canada, was recommending towers almost to the exclusion of all other works for defensible posts. By no means all of these were round towers, for by 1840-41 square towers on the pattern of those recommended for Lévis appear to have been recommended in about equal proportion to Martello towers.[28]

The failure to build the towers proposed by the Smyth Commission is easily explicable in terms of a commitment to large works, but the failure to build any of those recommended in the general defence reports of 1840 or after, despite their recognized value, is a more complex problem. Economy and the future measure of the Anglo-Canadian colonial relationship[29] were contributing factors but for the most part the lack of action was caused by the military confusion as to what measures were likely to be effective and to repay the costs of construction. In 1840 Sir Richard Jackson restated the obvious when he lamented the advantage given to the Americans by the long unfavourable line of the Canadian frontier and the American capacity to operate over the ice in winter when no aid was possible from Great Britain. In this way they could take possession of points necessary for future operations before the opening of navigation. In consequence he recommended a concentration of works at those points necessary to keep British options open. Even this was difficult to determine, however, for by the 1840s Canadian land communications had improved to the point that almost any work, and certainly any of those west of Kingston, would be by-passed by an enemy whose ultimate object was the fortress of Quebec. The British government did attempt to implement a pallid version of Jackson's proposals in the crisis year of 1845, but the authorized Kingston works were inadequate, and the defence of the vital Montreal area was relegated almost entirely to temporary fieldworks and a field force operating to the south. Even this was done to protect communications via the Rideau system, and to allow a naval contest on the Great Lakes, rather than to hamper an invasion appreciably. As early as 1841 the Board of Ordnance was rejecting works to resist an invasion because there were too many holes in the line, and recommending that works be confined to Quebec and Kingston.[30]

Despite the hasty authorization of a few works in 1845 the whole temper of British North American defence in the years 1840-45 appears to have been changing from a reliance on the principle of static defence clearly enunciated by the committee of 1825, and further corroborated by the later statements of Wellington and Smyth, to a reliance on a much larger force of British regulars to be sent to Canada in an actual emergency by means of an improved and defensible system of military communications. From reasons both of necessity and expediency the British government was returning to the 1812 principle of a reliance on men rather than on fortifications.

Communications had certainly been well-considered in 1825, but by the early 1840s the need to move large bodies of reinforcements inland the year round lent the issue a new urgency. This requirement is marked by the general survey of the Canadian water system, authorized in 1844 with a view to its military and naval utility and because of the need to move troops from Britain when the St. Lawrence was closed. It is also indicated by the survey of the long mooted line of military road between Halifax and Quebec ordered on 18 April 1845.[31] This growing concern with all-weather communication is further substantiated by the survey and plan of a £70,000 fortress at Grand Falls, New Brunswick, to protect this line although the government realized it was likely to be little used. In the end both this fortress and the military road failed to be implemented, with the dissolution of the Oregon crisis in 1846 and the suspension of all further works in December of that year.[32]

The year 1845 can be seen to mark the end of an era in the intended general use of new and extensive permanent fortifications in the defense of the interior of British North America, although this shift of priorities did not apply to Quebec City or the sea defence works on the Atlantic coast. Equally clearly, Martello towers were understood to be an effective and integral component of the various systems of permanent fortification articulated or approved between 1816 and 1845, and, in fact, were among the very last of such permanent works built in the Canadian interior.

The long history of the actual or intended use of Martello towers as a viable pattern of fortification, as delineated above, was only made possible by the lack of development of new instruments of offensive warfare. While the problem of effectively attacking Martello towers in the interior was often enhanced by the difficulty of moving artillery over bad roads or by available water transport, their continued use in positions accessible to naval or amphibious assault is reduced almost totally to the technical difficulties of breaching them with conventional smoothbore artillery from moderate range. This capacity of the available ordnance changed only in small degree from the early years of the 19th century until the introduction of rifled guns after 1860. Most of the naval ordnance, including the most common and effective 24- and 32-pounder guns in British service in 1800, were still in use in 1860, although the 56- and 68-pounders and shell guns of various calibres had been added. These last were of slightly longer range but effected no revolutionary changes in breaching capacity.[33] By the 1850s the technical improvements and quantitative increase in ordnance had led the British to consider the use of heavier earthworks at Halifax and other places exposed to the full brunt of an attack, but the subterranean masonry casemates that became a feature of the defences erected against the rifled gun were not contemplated until the 1860s.

Isolated Martello towers in British North America appear often to have been provided with a ditch and some measure of counterscarp, and of course those within batteries were afforded some degree of masking protection. Not until 1846, however, with the construction of three tower redoubts at Kingston, was such a protective measure against artillery deemed absolutely necessary. Even then only about one-half of the tower was covered. The first redoubted towers were suggested by Gustavus Nicolls for the Halifax peninsula in 1808, and tower 2 at Quebec had been intended as a redoubted work. This proposal was reiterated in 1816 for all the Quebec towers, and in 1827 Nicolls gave it as his opinion that all landward towers should be buttressed with earthworks.[34] Despite the apparent general agreement as to the utility of this mode of improving the defensibility of Martello towers, nothing was done about it.

Proposals for strongly counterscarped towers were revived in the plans for those in advance of Fort Henry, Kingston, in 1839,[35] and in 1840 Colonel Oldfield, the Commanding Royal Engineer in Canada, again brought forward the earlier plan for redoubting the Quebec towers. Because Quebec was indisputably the single most important British North American defence point and because the landlocked Martello towers constituted a significant portion of its defensive outworks, an examination of the suggested mode of their improvement provides a good measure of the techniques and funds available to the engineer corps in updating such towers.

From the outset the role of the Quebec towers had been to impede an assault against the main works, and this function was not diminished with the completion of the Cape Diamond Citadel in 1830. At that time it was intended to prepare and arm them for a 30-day siege.[36] In 1840 Oldfield proposed expanding the Quebec outworks, although the four towers on the Plains of Abraham were to remain the basis of the outer line. He postulated a six-month siege of Quebec in which a tower line, extending from tower 1 overlooking the St. Lawrence to the one to be built on the right bank of the Saint-Charles River, would delay an enemy two months. To make such a line tenable he proposed surrounding each of the four existing towers with a strong earthen redoubt at a cost of £1,244 each. His redoubts were to be composed of two faces and two flanks defended at the gorge by a strong stockade. Each was to mount three guns and contain a splinter-proof expense magazine, guardhouse, and provision and coal store.[37]

Oldfield's idea was not accepted, and in 1841 he again submitted a modified version of the same proposal. This time, from considerations of expense, he contemplated redoubting only towers 2 and 3 and flanking towers 1 and 4 with loopholed masonry walls. The Inspector General of Fortifications sustained his view of the propriety of defending the tower line while rejecting this particular proposal as inadequate. In the end, the temper of the times and the fact that Quebec was already the best defended point in Canada resulted in the strong redoubts never being provided. Their construction was relegated to the never-never land beyond the point where "the defenses of other parts of the province shall be well advanced."[38]

The British failure to improve the defensive circumstances of the Quebec towers, or any other of the existing British American Martello towers, shows the clear unwillingness of the government to spend money on such projects while at the same time indicating that no great technologically inspired urgency surrounded the projects. Even the theoretical designs of the engineers incorporated no additional innovative protection that could not have been substituted for by earthworks hastily thrown up in an emergency. Had time and the whims of the enemy allowed such a course of emergency construction, it would undoubtedly have been followed at each of the towers not already so protected.

The course of the whole era of British North American defence between 1816 and 1845 is chiefly marked by a largely unsuccessful attempt on the part of the imperial government to incorporate the negative lessons of the War of 1812 into its thinking, and to discover some system of defending the North American colonies with static permanent military defences and secure lines of communication prepared in time of peace. This process, revolutionary to a nation historically given to ignoring fortifications in peace and financing their vast and frenzied temporary proliferation in war, was ultimately defeated by the length and vulnerability of the British North American frontier. In the end the British government was forced to return more and more to the old mobile defensive pattern in the great stretches of the country beyond the reach of the guns of the Royal Navy.

This imperial experiment did, however, produce the Rideau Canal and, at Halifax, Quebec and Kingston, fully establish an age of casemated masonry fortification. In the restricted context of Martello towers, little was accomplished by a government preoccupied with the size and concentration of works, for the towers were essentially a product of a time of more limited financial means and defensive requirements demanding the impeding rather than the halting of an enemy force. Even when the conditions of British American warfare were altered once more by the limited willingness and capacity of the British treasury to meet the ever-escalating demand for fortresses, a reliance on the efficacy of field forces and improved communications prevented the reinstatement of the pre-1815 role of Martello towers, except at Kingston. There they were thrown up by an accident of geography and political expediency, and the final spasm of the military largesse of the British treasury in the Canadian interior.

While no new Martello towers were commenced in the years 1816 to 1845, and by the latter date they were nearing the verge of military obsolescence, their continuing local military popularity and versatility was indicated by their frequent proposal to fulfill a wide variety of military needs in much the same manner as they had between 1796 and 1815. Their persistent military utility is indisputable. This is evident despite the fact that by 1827 the ten existing towers were being badly neglected and allowed to decay below a point of immediate usefulness by an ordnance corps and government preoccupied with the construction of new works and caught up in the bureaucratic lethargy of the army in a time of peace.

The allocated role of Martello towers remained essentially unaltered through the three decades after 1815; but, with one largely accidental respite, the death knell of the towers as respectable works was to be inexorably rung in the following two decades.

The Construction and Arming of the Kingston Towers: 1845-63

The six round stone towers erected at Kingston, Upper Canada, between the years 1845 and 1848 were a politically expedient and only marginally militarily efficient response to the dangers posed to the defence of British North America and to the British army in Upper Canada as a result of the Oregon crisis of 1845-46. They incorporated significantly innovative structural and external features designed to adapt them to the gradual evolution of the defensive art and the firepower of heavy smoothbore American naval ordnance. However, they began to be obsolete by the time they were completed in 1848. This process was virtually finished by the time they were finally armed in 1863. The Kingston towers represent the culmination of the cycle of employment of round masonry towers in British North America. Given the date and circumstances of their construction, these towers must be examined as political and technological barometers of change rather than with a single-minded emphasis on their intrinsic military value. They never made any significant contribution to the military and naval security of Kingston.

These towers, in addition to being the last examples of their type constructed in British North America, were the final phase of the very long process of erecting works for the defence of Kingston, begun with the establishment of the first Fort Frontenac there in 1673. Kingston's location at the confluence of two great inland water routes had early recommended it to France as a point of strategic importance. It was a defensive bulwark to the French settlements on the river and a supply depot and offensive military and naval base sustaining their imperial ambitions to the south and west, and the French occupied the fort continuously until forced to abandon it to the English in 1759.

With the collapse of New France, this strategic junction was of small importance to a power indisputably pre-eminent in eastern North America, and Great Britain could afford to abandon it. After 1776 the British preferred to establish a fort and naval base on nearby Carleton Island rather than at Kingston. Not until 1788, in consequence of the imminent loss of the island base as a result of the peace of 1783, was the naval establishment transferred to Point Frederick and Navy Bay at Kingston. It immediately became the principal British naval base on Lake Ontario but, because the Americans' power in the interior was in its infancy, almost no measures were taken for its defence until the commencement of the War of 1812.

The nature of the American campaigns in that war and an unsuccessful American naval attack on the town in 1812 clearly delineated Kingston's importance to Great Britain. With its permanent loss or destruction all naval operations to the west and a continuation of the naval contest for the control of the lakes would be immediately impossible. Consequently its defences were improved, so that before the end of the war they consisted of an irregular fort on Point Henry, a battery on Murney's Point, and a five gun battery on Point Frederick which had been added to the hastily prepared 1812 defences.

While the War of 1812 clearly demonstrated the necessity of retaining Kingston and the naval control of Lake Ontario, the peace that resulted in the Anglo-American naval agreement, and Lord Bathurst's order of 10 October 1815, prohibiting new defensive expenditures at Kingston, quickly eliminated any chance of its rapid military development.[1] Kingston's urgent needs were immediately voiced in the fortification report commissioned by Governor General Sherbrooke in 1816 and submitted to Lord Bathurst, the Secretary for War, late in that year. It accorded great importance to Kingston as the depot and dockyard of Upper Canada, and proposed its permanent defence by improving Fort Henry and erecting round masonry towers to the north of it as outworks on the landward side. It also recommended round towers as keeps for batteries on Point Frederick and Cedar Island.[2] This report contemplated only a defence of the Point Frederick naval establishment. Sherbrooke himself was a proponent of towers and he may have influenced their suggested use at Kingston.

No action was taken on this proposal, but it reinforced the views of the Duke of Richmond, who envisioned Kingston as the citadel of Upper Canada with a role analagous to that of Quebec in the lower province. He believed it would provide a secure retreat for shipping and a staging point for reinforcements sent into the interior against the Americans. Richmond's scheme was taken up by the Duke of Wellington, the newly appointed Master General of the Ordnance, who incorporated it into a submission on British North American defence that he made to the Earl of Bathurst in March 1819.[3] Wellington was never very interested in or sanguine about a successful defence of British North America, but by the weight of his military reputation he exerted a disproportionate influence on its development. He held the cabinet post of Master General until 1827 and remained a consultant on military affairs for many years afterward. His views also dominated the Smyth Commission of 1825, which exerted a direct influence on policy at Kingston and elsewhere until 1845. The Smyth report's vestigial remnants remained in evidence until the Jervois reports of 1864 and 1865. Wellington was a proponent of sound and secure communications; as such he was dubious of the British ability to maintain even the naval command of Lake Ontario in a future war and was certain that the St. Lawrence River route would be cut west of Montreal. In consequence he proposed an elaborate system of alternative water routes to the north of the existing vulnerable one. The most likely of these, the Ottawa-Rideau system, would debouch at Kingston, which, in any development, was posited as a vital communication centre and defensive anchorage, in addition to its existing roles as a military base and naval depot. In view of its importance, Wellington recommended its thorough all-round defence.[4] Despite the changing fashions of its proposed defence, his 1819 view of Kingston's importance, substantiated by the completion of the Rideau Canal system in 1832, was never seriously challenged before the 1860s.

A new Kingston defence plan was articulated by the commission headed by Major-General James Carmichael Smyth, R. E. This report, submitted in September 1825, recommended the building of the Rideau Canal and the defence of Kingston by permanent works, as it was only 30 miles from the important American naval base at Sackets Harbor, New York, and was subject to reduction by *coup de main* by a naval attack alone, or by a naval attack in conjunction with an assault by American troops landed nearby. The commission considered a naval attack on the military and dockyard establishment on the eastern side of the harbour more likely to be of serious consequence, and so did not contemplate a permanent defence of the town of Kingston or its western land approaches. Defence on this direction was commended largely to field works and available land forces.

The commission felt the existing defences were well placed but too hastily and badly constructed to be of much permanent use. Consequently, it recommended that Fort Henry be improved and that the existing batteries at Point Frederick and Mississauga Point be enclosed and defended in the rear. It further proposed that the naval defence be augmented by a two-gun tower on Cedar Island to prevent a landing in Hamilton Cove, and that a strong tower be erected on Snake Island near the main shipping channel to serve as a keep for a battery to be erected there in an emergency. It also proposed to erect another tower 1,000 yards in advance of Fort Henry to defend the approaches to the dockyard. Most of the 1812-14 blockhouses to the rear of the town were defunct and the Smyth Commission proposed substituting a single centrally located enclosed work there as a keep and rallying point for an emergency line of fieldworks. In total, the commission recommended spending £201,718 at Kingston. Most of it was to be used to turn Fort Henry into a respectable fort requiring a regular heavy artillery siege for its reduction.[5]

The committee's report on the feasibility of defending British North America by means of the Rideau Canal and a few strategically located forts quickly met a positive response in Britain. By March 1826 the Master General, the Duke of Wellington, had approved such works for Montreal, Kingston and the Niagara frontier. Additionally, there were to be a number of ancillary works scattered along the frontier and the approaches to Montreal.[6] As valuable and necessary as the new Fort Henry was recognized to be, in forcing an enemy to divert a considerable force to undertake siege operations against it before proceeding to an all-out attack on Montreal and Quebec, it was clear that the fort could perform only a limited local defence role because of its lack of outworks and remoteness from the commercial harbour and the entrance to the canal. A number of permanent supporting defensive works were deemed necessary, and the nature and extent of these works were to be the subject of a prolonged controversy that culminated in the construction of the Martello towers after 1845.

In June 1826, Lieutenant Colonel Wright, the commanding Royal Engineer in Upper Canada, was ordered to make a further report and draw up detailed plans for the recommended Kingston works. In February 1827, he reported himself in substantial agreement with the Smyth Commission except that he felt the security of the dockyard required two additional detached stone towers in advance of Point Frederick. Although his view was sustained by his superior, Colonel Durnford, the commanding Royal Engineer for Canada, it was objected to by Major General Smyth. He did not dispute the desirability of such towers, but argued that this avenue of approach to the dockyard would afford an enemy no more facilities than he would already possess if he were in control of the weakly defended town and could bombard it from there. By October 1827 Smyth had been overruled and the extra towers accepted. Work was to begin with Fort Henry and the next priority was accorded to the Cedar and Snake Island towers.[7]

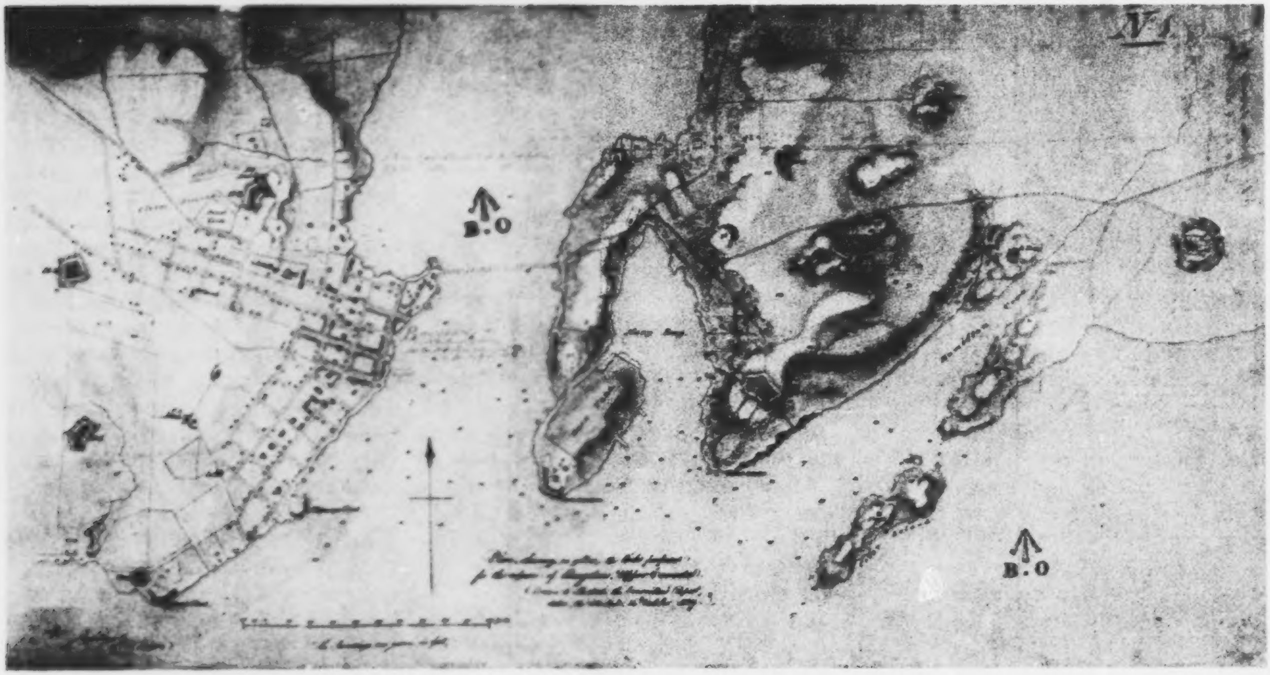
The whole scheme was negated by the treasury, which balked at the expenditure. In 1828 another commission composed of Lieutenant Colonels Fanshawe and Lewis was appointed to bring in an estimate within the authorized limit of £186,087. They failed in this, although their report effectively reversed the priorities of the Smyth Commission by proposing the reduction of the size and prominence of the new Fort Henry to a large casemated redoubt and advocating a more balanced all-round defence of town, harbour and dockyard by means of a landward arc of redoubts and towers. This arc would extend from Hamilton Cove to Murney Point and operate in conjunction with the proposed and existing sea batteries and towers. This plan was finally adopted in England on 24 October 1829.[8]

Once again the Treasury objected to the cost, now estimated at £273,000, and would not agree to even a modified version of the plan until January 1832. The Treasury was finally convinced that each of the small components of the system could be given separate financial authorization and an immediate and general authorization of a large sum avoided.[9] While this 1832 compromise was a useful short-term expedient which facilitated the commencement of Fort Henry in that year, it was to wreak havoc with the military priorities of the overall development plan. In this way it was instrumental in a second 1845 compromise that produced the four main Martello towers.

The 1832 compromise contemplated the eventual construction of the Cedar and Snake Island towers, three towers and two casemated redoubts to the rear of Points Henry and Frederick, three casemated redoubts behind the town, improvement of the existing Point Frederick and Mississauga batteries, and a tower and battery on Murney Point, in addition to the major work on Point Henry. Most of the landside works were intended for sites that were private property. As early as 1828 Fanshawe and Lewis had recommended that all of the necessarily extensive purchases be carried out before the plan was known and land prices inflated by piecemeal acquisition.[10]

The nature of the 1832 compromise made such a rational expedient impossible. The treasury was unwilling to approve large speculative land purchases for works which it must have felt would never be entirely completed. Consequently when it was desirable to expand Kingston's defences in the early 1840s, the purchase price of the necessary land was estimated as high as £100,000.[11]

5 Plan of the city and harbours of Kingston, Ontario, 1829, showing the location of the works approved in the new defence plan of that year. *(Public Archives of Canada.)*



Fort Henry was completed by 1836 and an advanced sea battery was added to it by 1842. Before this, however, the Rideau Canal had been completed and Kingston had become the military, naval and logistical pivot for the whole western end of the Canadian defence line. With the emerging acceptance of the general failure of a policy of permanent fortifications in the early 1840s, the recognition that American naval control of the lakes would be almost impossible to dispute, and a return to a theoretical reliance on well-supplied field forces with good communications, the retention of Kingston became even more essential. Its sudden loss would mean a termination of operations to the west and could lead to the whole western army being cut off and humiliated.[12] George Murray, the Master General of the Ordnance, asserted in 1842 that, "upon the possession of Kingston will depend, more than upon that of any other place, the possession of the Upper Province."[13] Consequently the further fortification of Kingston came to be seen as second in order of priority after Quebec. By 1845 its importance and vulnerability were important factors behind the hastily prepared tower proposed for that year.

While nothing was accomplished before 1845, detailed plans for extending the Kingston towers and redoubts were in train as early as 1838 in anticipation of the completion of the Fort Henry works, though final plans for them were not prepared until 1841. This great delay was of little consequence, for as early as 1840 the dormant land question had asserted itself in the form of an estimate of £57,920 for purchase of the sites of the five redoubts and the Murney Point position alone. Land prices were vastly inflated by speculators hoping that Kingston would become the seat of government and, although a few small purchases were made, it was very soon evident that some alteration in the original defence plan would be necessary. If this were to be so, Colonel Oldfield quickly recommended abandoning the townside redoubts and concentrating on the eastern side and harbour defence works.[14]

These doubts as to the viability of carrying the whole plan into effect, and Sir Richard Jackson's concern with the overall defences of the provinces, prompted the Master General of Ordnance, after consultation with Lord John Russell, the Colonial Secretary, to order a further review of the whole defence question with a particular emphasis on Kingston.[15] The Inspector General of Fortifications, Sir F. W. Mulcaster, promptly replied that the Kingston works could not be diminished without a sacrifice to the security of the town, harbour and dockyard, and recommended the commencement of a redoubt and two towers, but only if the land necessary for all the works was previously purchased.[16]

The intractability of the Treasury Board made such a course impossible and, in fact, in 1842 it suspended the expenditure of £10,000 already voted by Parliament for the Kingston works as it would tend to have an inflationary effect on land prices.[17] This suspension was predicated on the expectation of the early passage of a vesting act by the Canadian legislature. This act would have given the British government powers of expropriation. Even if, as the colonial secretary believed, its power could not be generally used, the act would deflate prices to some extent. The act was passed at the end of 1843.[18]

By that date the pendulum had swung once more and George Murray, Master General of the Ordnance, had explicitly abandoned any intention to defend the town of Kingston with permanent works. He declared that all works should be limited to the eastern side of Kingston harbour where most of the land was already in possession of the ordnance, and all necessary additions could be purchased for £5,795.[19] Murray claimed to have formed this impression on a brief visit there in 1815, and by 1843 he found it sustained by exorbitant land costs for works that the expansion of the town might soon render useless. His view was accepted and incorporated into the revised Kingston defence priorities forwarded to Canada in September 1843, although the 1829 defence plan was not formally revised.[20]

Even this more modest proposal was thwarted by the treasury when, on 1 April 1844, it refused to countenance any further cash land purchases whatsoever, limiting the ordnance to such property as it could acquire by exchange. The ordnance reported that as long as it was bound by the formal terms of the 1829 plan it possessed no exchangeable land at all. At this juncture some formal alterations of the accepted plan became inevitable. In May 1844, Colonel Holloway, Commanding Royal Engineer for Canada, was instructed on the orders of the colonial secretary to submit a revised plan for the defence of Point Henry and the dockyard.[21] At this point the whole Kingston defence question had returned in principle to the views of the Smyth Commission of 1825, with its restrictive idea of defending only those points of immediate military consequence.

Until 1844 the Kingston defence question was approached with the lethargy and inefficiency so typical of the peacetime military establishment. This attitude changed abruptly with the election of James K. Polk as president of the United States in November of that year. In the summer Polk had campaigned on a demand for the control of the entire Oregon Territory and spoken of the annexation of the whole of British North America. Given the chauvinistic fervour of American politics, the British military was not alarmed. Polk's continuing belligerence after the election, however, brought the spectre of an Anglo-American war much closer and prompted the British government to a hasty re-evaluation of the woefully inadequate defences of British North America.

Scattered large permanent works had been found to be militarily inadequate and financially impracticable. Given British naval supremacy and the prospects of a diplomatic settlement to the crisis, the imperial government was unwilling to authorize large speculative increases in the regular army in British North America. This caution may also have been conditioned by the desire to avoid a military disaster to the regular army in the Canadian interior where it was at such a manifest disadvantage. A lack of permanent works and an unreinforced regular force placed a premium on the vigour and reliability of the militia in the early stages of any conflict. By 1845 British officialdom was casting about for some cheap, speedy and useful mark of an enduring interest that would at once reassure the populace and its military forces and serve some useful military purpose. Robert Peel, the prime minister, stated that large works proceeded too slowly and in consequence could have no military value or salutory effect on Canadian morale.[22]

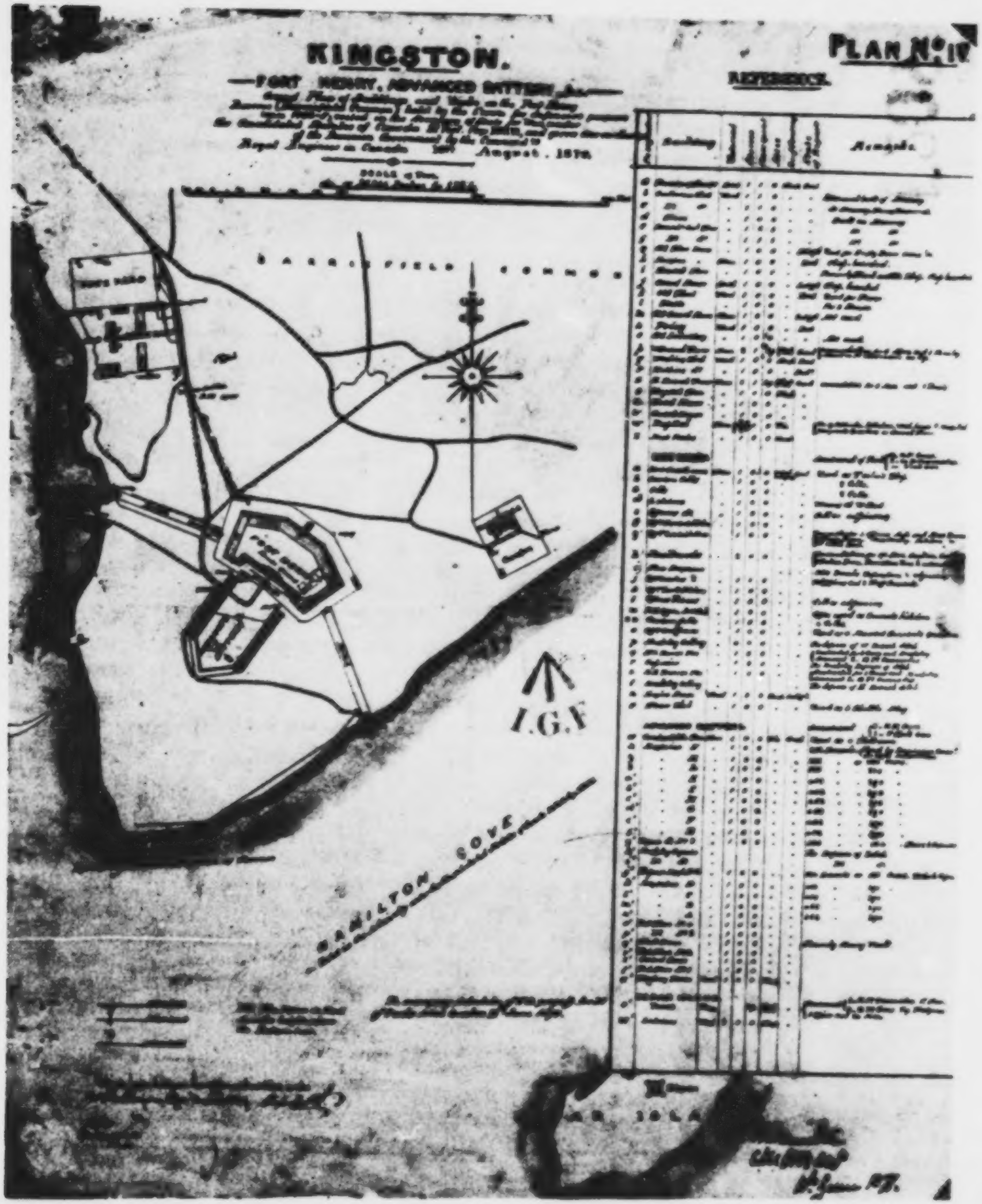
Under these circumstances Kingston, with its pivotal position and role, was the ideal site for some display of preparatory ardour, and the construction of Martello towers was the ideal expedient. Their political value was, of course, only one of a number of factors contributing to the government's eventual course of action, but, notwithstanding the military necessity of retaining Kingston, it appears to have been at least as important as any other in the decision to construct only a marginally useful range of towers that left Kingston fully exposed to an assault from the landward side.

The continuing governmental concern with the defensibility of Kingston was substantiated by George Murray's statement in September 1844 that he did not believe Kingston to be defensible against a combined military and naval attack.[23] While little of a permanent nature could be done quickly and cheaply on the land side, the naval and commercial harbours were amenable to improvement because most of the necessary sites had been retained from the outset as crown military reserves. The need for more formidable harbour defences had also increased over the preceding few years with the appearance of American steam war vessels on Lake Ontario. Kingston was fully exposed to winds from the lake, and light harbour defences had sufficed against sailing vessels, with their restricted power of manoeuvering independently of the wind and engaging in heavy stationary bombardments.[24] No such restrictions applied to steamships.

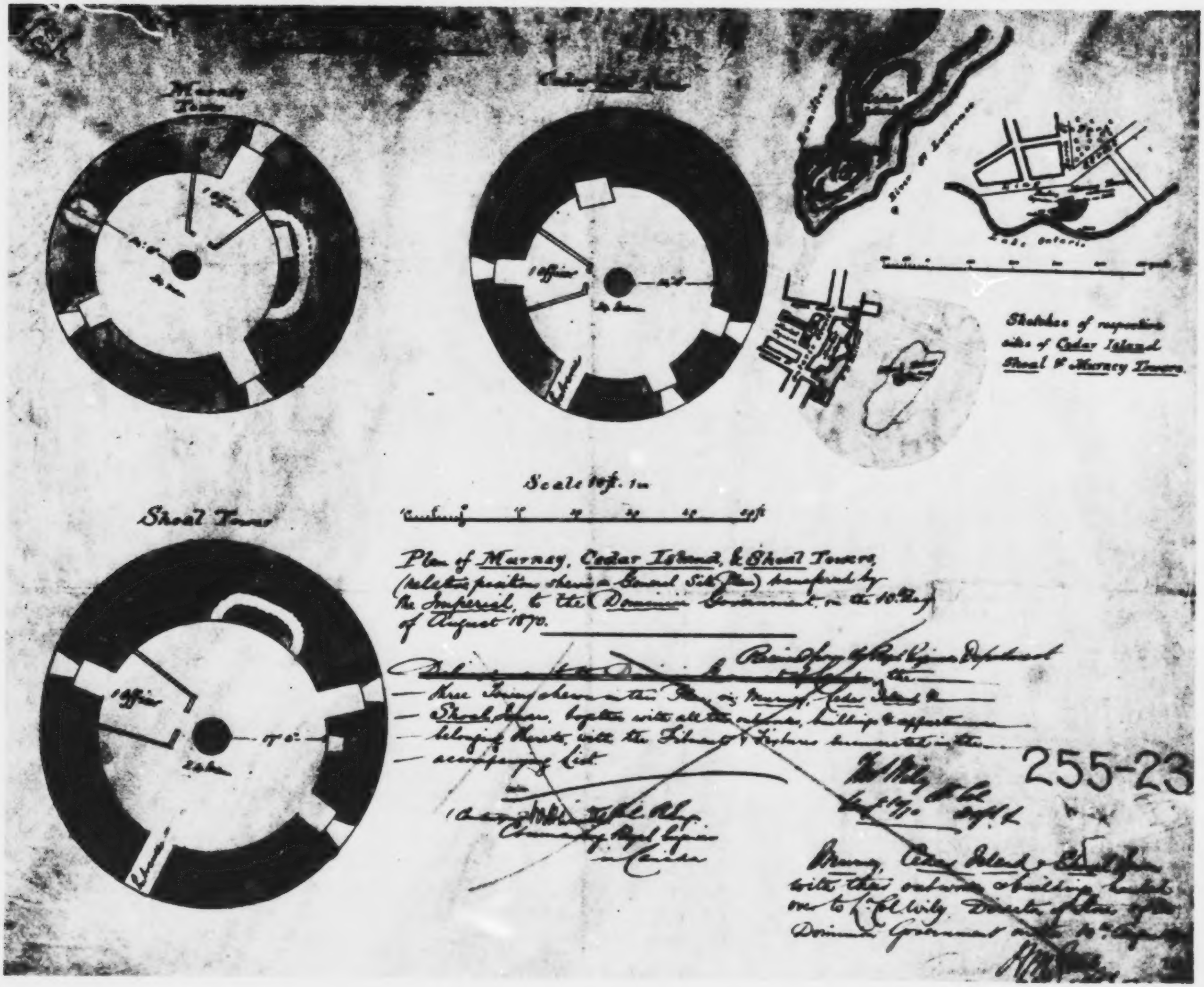
It was this resurgence of naval considerations that apparently moved Lord Stanley to order, on 23 January 1845, immediate plans and estimates prepared for the defence of the dockyard and entrance to the Rideau Canal from attack by a naval force. In the atmosphere of barely suppressed emergency prevailing in 1845, and under considerations of time, expense, impressiveness and utility, it is hardly suprising that the engineers turned to Martello towers as the most likely means of meeting the terms of Lord Stanley's directive. Such towers had been a suggested and versatile component of Kingston's defences since 1816 and fully detailed drawings had already been prepared.[25] Consequently, it was possible for Colonel Holloway, the commanding Royal Engineer for Canada, to return preliminary plans and estimates for a system of naval defence towers and batteries as early as 12 June 1845. A shortage of time and staff, however, precluded a fully detailed submission; these towers were adopted much as proposed.

Holloway opened his proposal by adverting to the fact that the full security of Navy Bay and the commercial harbour required that the defences of Fort Henry be made as complete as possible. This in turn would require construction of the redoubt and towers in advance of it, as proposed by the commission of 1826. However, he said, "I am not sure whether the master general considers their construction under the existing circumstances to be

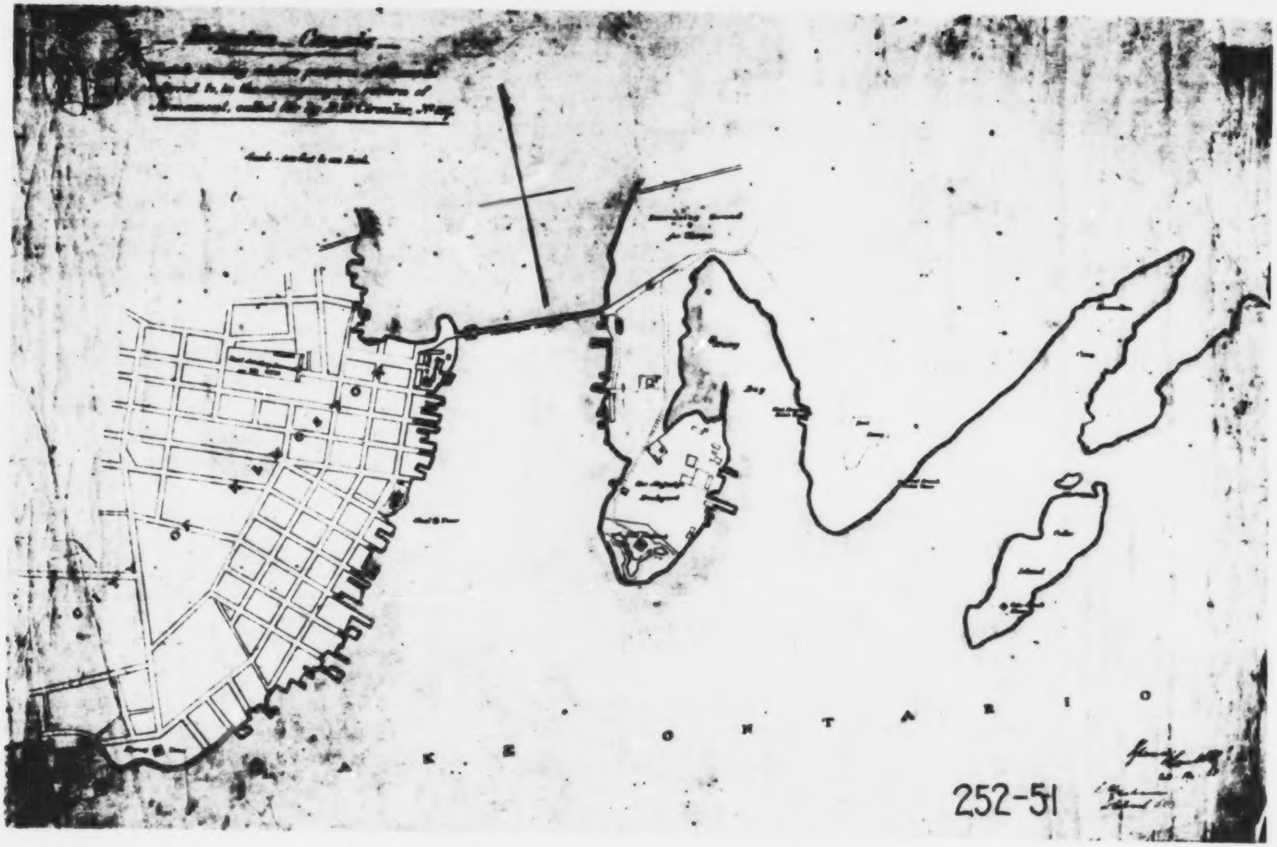
6 Plan of Point Henry and Cedar Island, 1871, showing the location of the Branch Ditch and Cedar Island towers, with notes on their structure, armament and capacity.
(Public Archives of Canada.)



7 Location sketches and barrack floor plans of the Shoal, Murney and Cedar Island towers, 1870. *(Public Archives of Canada.)*


Murney Tower
1 Officer
Shoal Tower
1 Officer
Sketches of respective sites of Cedar Island Shoal & Murney Towers
Lake Ontario
Scale 10 ft. 1 in
Plan of Murney, Cedar Island, & Shoal Towers, (relative position shewn on General Site Plan) transferred by the Imperial, to the Dominion Government, on the 10th day of August 1870.
accompanying List.
Commanding Royal Engineers in Canada
Murney, Cedar Island & Shoal Towers with their outworks & buildings handed over to Lt. Col. Wily Director of Stores of the Dominion Government on the 10th August
255-23

8 Plan of the town and harbours of Kingston, Ontario, 1869, showing the location of the existing defence works.
(Public Archives of Canada.)



indispensable for the present design of securing the harbour,"[26] and went on to detail his new suggested tower locations. He first suggested re-positioning the long-proposed Cedar Island tower at the southern extremity of the island so it could better cooperate in the general defence of the harbour. He next deemed it advisable to reform and improve Fort Frederick as an earthen sea battery for heavy guns, closed in the rear by a loopholed musketry parapet, with a masonry tower in the centre as a keep, mounting three 24-pounder howitzers. Holloway also recommended that a tower for two 32-pounder guns and one 24-pounder howitzer be placed on the shoal in front of the town. This tower would be slightly in advance of a new heavy battery to be placed on the military reserve on the waterfront directly in front of the Market House. In time of war the Market House itself could be used to defend the gorge of the battery. Because of Murney Point's distance from the shipping channels and other works, Holloway considered it only an auxiliary to the lake defences and recommended defending it with a tower rather than by the sea battery recommended in 1829. Holloway believed the above works would provide a secure naval defence at a cost of £51,000.[27]

George Murray accepted Holloway's proposal without demur and on 28 July 1845 it was forwarded to Lord Stanley for his approval. At that time Murray made it clear that "This construction must be deemed to be ultimately indefensible, however, against a combined military and naval operation."[28]

The limited value of the works fully met the needs of the Colonial Office. The decision to proceed without delay to their execution, contingent on treasury approval, was communicated to the Master General of the Ordnance on 15 August 1845.[29] On 28 August this decision was communicated to Holloway in Canada with orders to prepare detailed submissions for the works[30] for inclusion in the next Ordnance estimates.

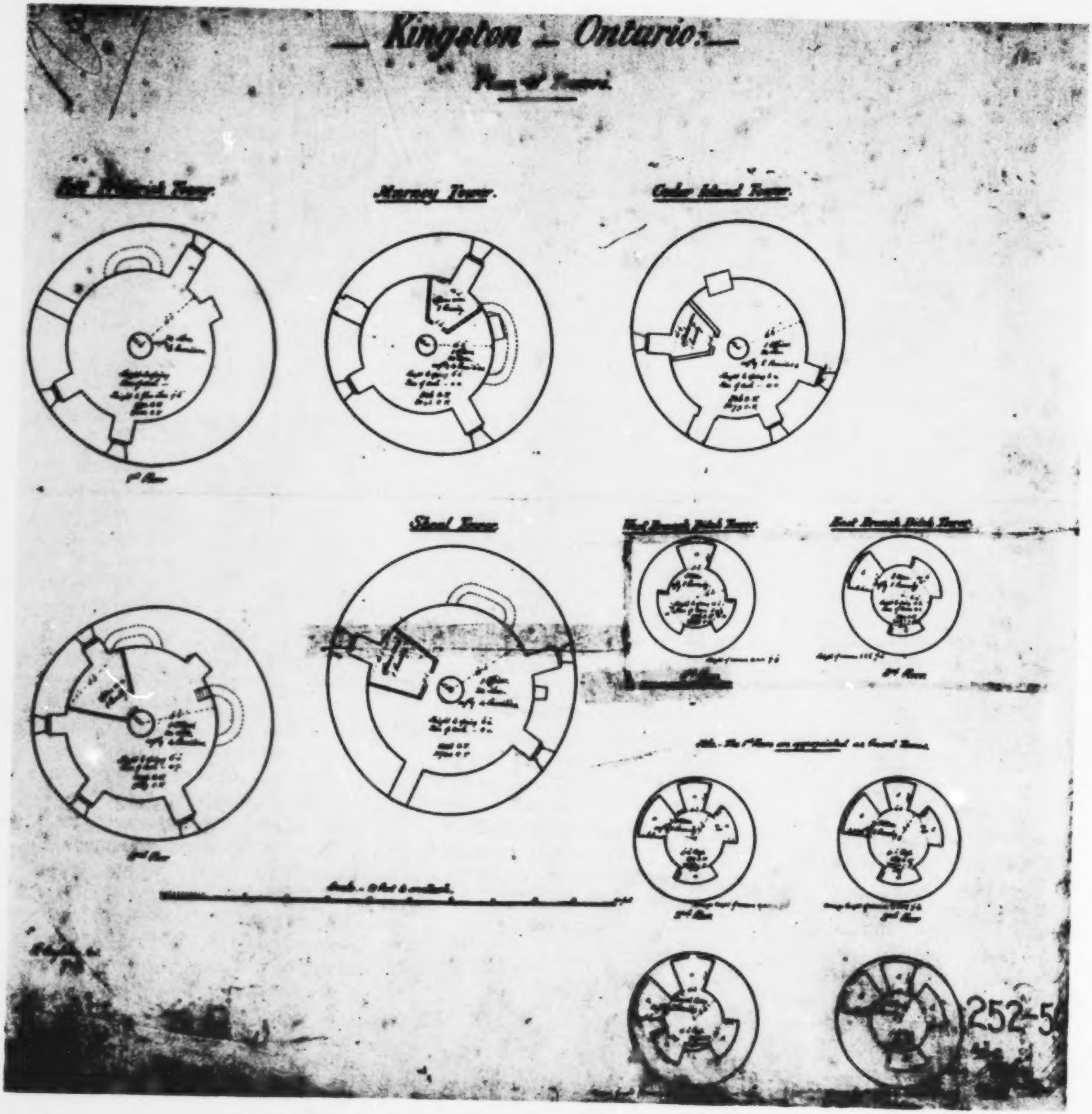
Up to this point agreement on the towers had proceeded in a regular, if unusually expeditious manner, and construction normally would have commenced in mid-1846 at the earliest. The continuing Anglo-American diplomatic crisis, however, and the succession of Sir Richard Jackson, the commander of the forces, by Cathcart as Governor General and commander of the forces precipitated an early beginning. In December 1845 Cathcart feared that his whole force in Upper Canada might be trapped by a sudden American assault on Kingston and ordered construction of the approved works begun on his authority as commander of the forces, rather than awaiting parliamentary approval.[31] The urgency and extent of the works precluded their completion by military artificers, and private tenders were called before the end of 1845.

On 28 January 1846 Cathcart approved bids for four towers from the most reliable, though not the lowest, of the bidders. Immediate construction costs were to be met from the military chest in anticipation of parliamentary approval. The approved tenders totaled £47,787.6.10½, distributed as follows: Murney Point tower, £6,181; Cedar Island tower, £9,836; Market Shoal tower, £6,885; Market Place battery, £9,013; and the Point Frederick Fort and tower, £15,543.[32]

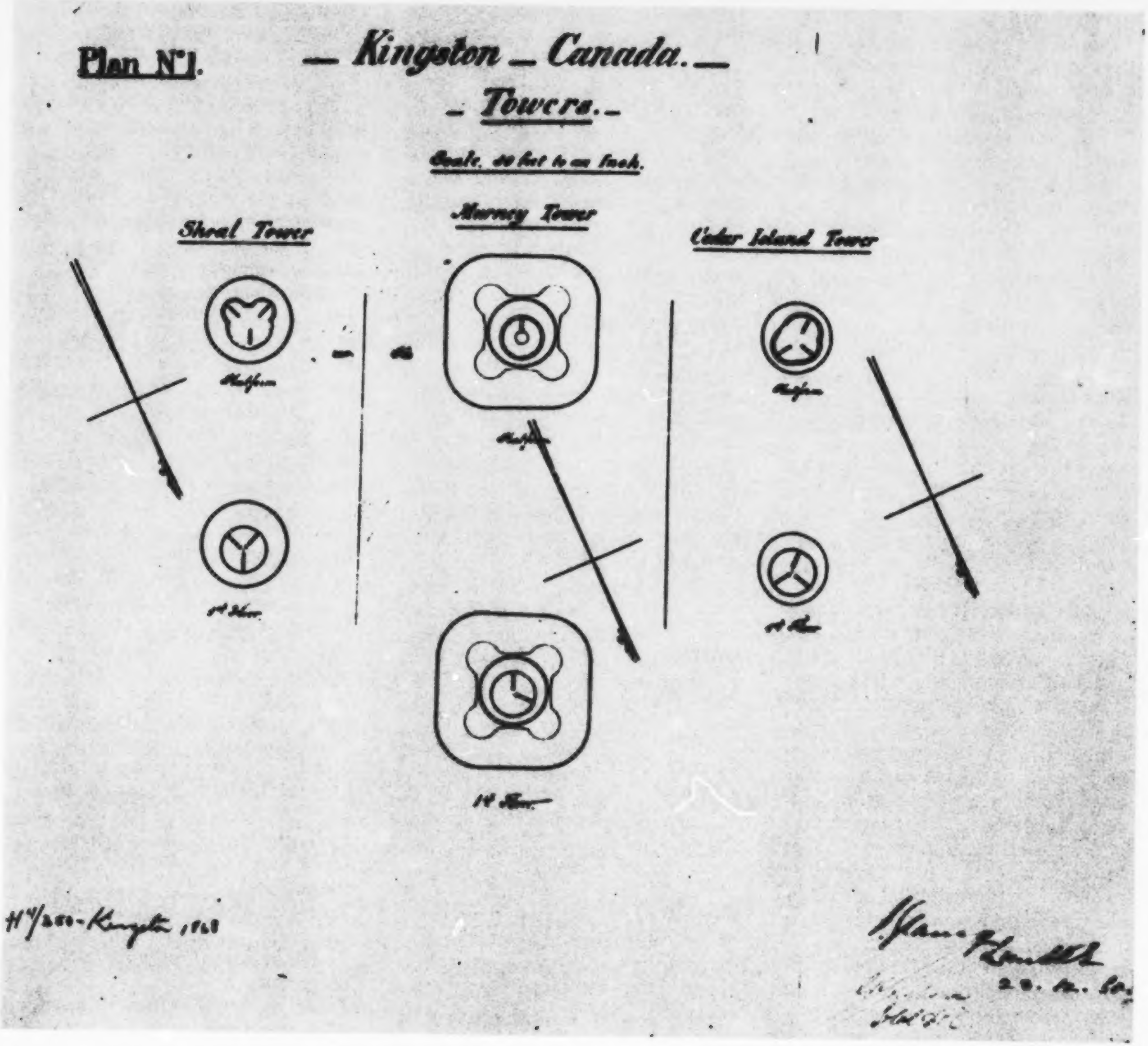
These figures were returned to the Inspector General of Fortifications on 28 January 1846 and received his grudging acceptance, although he had clearly not anticipated such an early start to the work. John F. Burgoyne, the Inspector General, stated that "The collecting and prepairing [*sic*] of materials, excavating foundations and receiving tenders . . . would seem to imply a degree of preparation that might preclude the use of any further consideration being given to the projects."[33] This was the case, and thereafter work progressed with little overseas direction.

The four main harbour defence towers were indisputably Martello towers, and, although freely adapted to meet local needs, all were of an essentially similar design. While they were circular rather that ovoid in their exterior form, Colonel Holloway reported in 1845, that they would "follow the ordinary formation of towers."[34] This was particularly true of their internal structure and accoutrements. By the time of their completion, however, the three land-based towers had ac-

9 Barrack floor plans of the Kingston towers, 1869.
(Public Archives of Canada.)



10 Barrack level and platform plans of the Shoal, Murney and Cedar Island towers, 1868, showing the quantity and location of the mounted ordnance.
(Public Archives of Canada.)



quired a sophisticated caponiered flank defence and masking from cannonade that must have rendered them among the most technologically advanced of any Martello towers in the world. Certainly they had no British North American peers.

Each of the towers was to be at least a two-storey structure with a masonry exterior wall faced with ashlar limestone, rubble filling and a brick-lined interior. They were to be between 50 and 65 ft. in exterior diameter at the base and, with the exception of the 44-foot-high three-storey Fort Frederick tower, all were to have exterior walls between 33 and 38 ft. high. In each of the towers the circular interior compartment was to be offset within the circular exterior wall giving an ovoid appearance to their plans and providing a wall of unequal thickness heavily biased toward the likely avenue of bombardment from the lake. The approximate proportions of these walls varied from 9 to 15 ft. Each tower was to be heavily arched in ashlar masonry above its barrack level. The arch was to be sustained at the centre by a masonry pillar and capped by an ashlar masonry terreplein. Each of the works was to be adapted for heavy guns behind a masonry parapet. The barrack floors of the towers were to be embrasured for carronades and the only entrance to each was to be through a double reinforced door opening into the second, or barrack, level of the tower. All were to be fitted with basement magazines, cooking facilities, storage areas and pumps or cistern water facilities to render each capable of independently supporting a garrison through a long siege.[35]

From the outset each of the towers, with the exception of that to be erected on the Market Shoal where external defences were impracticable, was intended to be masked from the worst effects of naval gunfire and protected from unimpeded infantry assault by provision of a ditch, stone revetted counterscarp and glacis.[36] This ditch, however, provided no defence against an enemy established at the base of the tower, and Colonel Holloway proposed to effect this necessary protection by means of four mutually supporting loop-holed galleries or caponiers attached to the base of each tower in preference to the more usual machicolation galleries on the parapet. He included them in the contractor's plans for the Murney, Point Frederick and Cedar Island towers on his own initiative, as they would be completely hidden from cannonade at any distance and so would well repay their cost of £129 each.[37] These precautions did not completely shield the towers from gunfire though they were an improvement over anything else in British North America.

The prior preparations, estimates and plans for the four Martello towers were formally authorized as emergency defence construction by the new Secretary of State for the Colonies, W. E. Gladstone, on 3 March 1846.[38] When this was communicated to Canada, however, all of the contracts had been issued for months and preparations for construction were well in train. This was particularly true at the accessible and conveniently located Murney Tower and the site of the Shoal Tower. In the latter case, if construction were to commence in 1846, a coffer-dam had to be constructed on the ice, sunk on the shoal as the ice melted, and pumped out to permit the workmen to build the foundation.[39] All of the towers were in preparation by the end of March. It was at this time that names were fixed for them. Colonel Holloway had proposed in February 1846 that each of the towers be named after an official personage but the Inspector General of Fortifications and the Master General of the Ordnance felt that naming the works by locale would be more appropriate. Thus we have the names Cedar Island, Murney and Shoal towers although the Canadian officials persisted for some time in calling them respectively Cathcart Redoubt, Murray Redoubt, and Victoria Tower. By June the Murney Tower was well under construction, and by September 1846 all were reported in advanced condition.[40] Despite this rapid early progress, work slowed with the dissipation of the Oregon crisis after mid-1846, and by the end of the year only the Murney Tower had been completed.[41] Work continued in 1847 and by September, Colonel Holloway could make the following report on the towers:

Tower on Murney's Point 100% complete
Tower at Point Frederick 90% complete
Tower on Shoal in front of town 91% complete
Tower on Cedar Island 88% complete.[42]

In October he stated his expectation that most of the towers would be completed by the end of the year; certainly all of them were ready for arming early in 1848. The final detailed projected cost of each tower was £10,251 for Cedar Island, £8,542 for Shoal Tower, £6,856 for Murney Tower, and £7,442 for the one at Point Frederick. All but that on the Market Shoal apparently included the costs of counterscarps and glacis, and in total their cost was only £2,944 in excess of the preliminary estimate of June 1845.[43]

Branch Ditch Towers

In addition to the four main Martello towers being erected at Kingston in 1846 a functionally similar, but smaller and lighter, tower was under construction at the lower extremity of each of the two branch ditches that extended down the slope from Fort Henry to the water's edge and isolated the end of the peninsula on which it was situated. These towers were not directly related to the harbour defence programme and were first suggested by Colonel Holloway in November 1845 to correct one of the numerous technical defects of Fort Henry.[44]

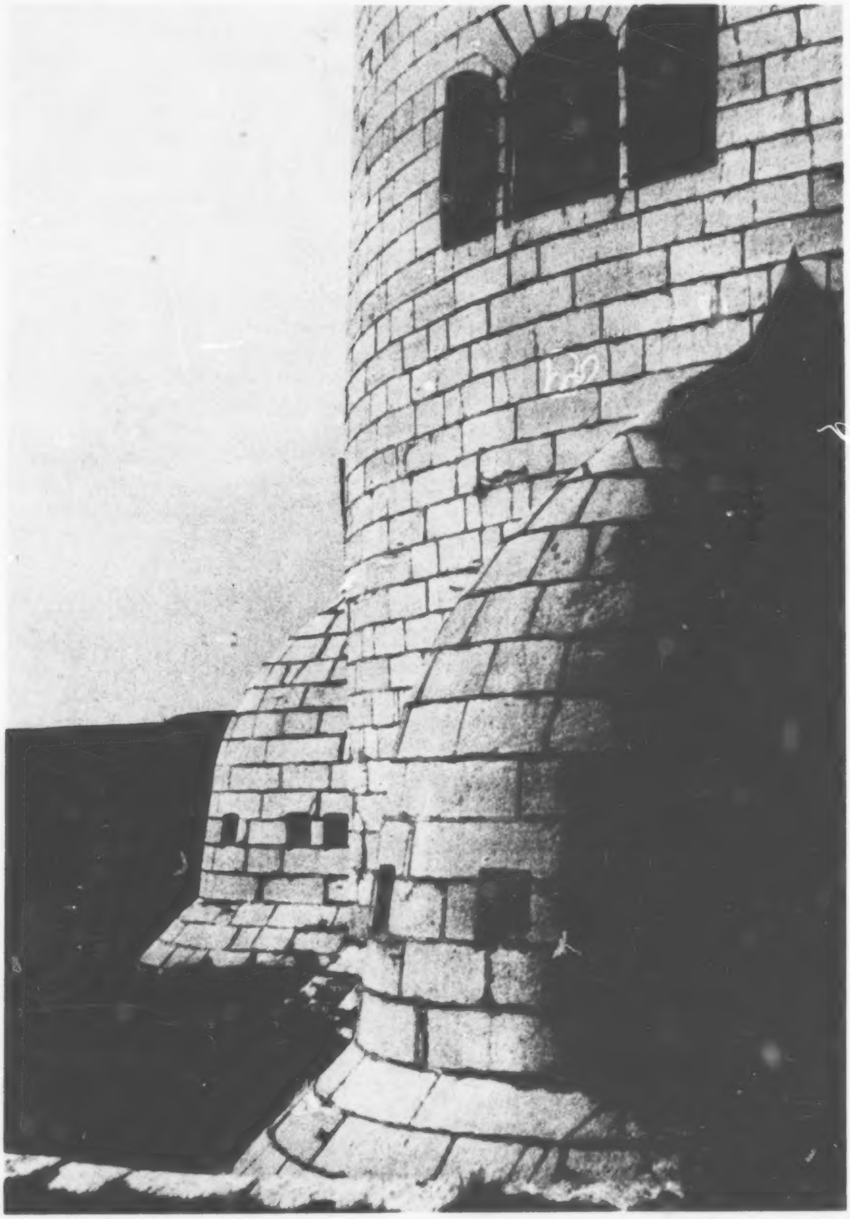
The interiors of the branch ditches were not adequately flanked from the fort and the steep and irregular drop from fort to shore left the shoreline itself poorly defended against an assault landing. Defensible guardhouses had earlier been approved for these locations. In late 1845 Holloway reported their substitution by the small towers at an estimated cost of £6,262. They were to be of "hammer dressed masonry with reverse fires looking into the ditch, the lower floor to be used as a soldiers room for 20 men with single berths two tiers high, the walls to be loop-holed . . . and a pintle for a traversing gun placed on top."[45] Burgoyne agreed with the substitution but advised against placing the towers across the entire ditch saying, "but merely add a tower there with a slight projection for flanking the ditch; – the same tower being made also to flank the shore if possible within and without, and be self-defensible."[46]

Accordingly the towers were cornered into the extremity of the ditch with flanking embrasures and loopholes. A loopholed musketry gallery and caponier, and the loopholed exterior face of the tower itself, were directed toward the shore. These towers contained three interior storeys and had a terreplein for one gun on top, behind a parapet. They were both approximately 30 ft. in exterior diameter and 45 ft. high. The exterior wall of each was 8 ft. thick on the water side where it might be exposed to cannonade but reduced in places on the landward side to a couple of feet. This was apparently to permit their easy reduction from Fort Henry if they were captured during an attack and to allow the easier working of their ordnance. These selective indentations gave a very irregular appearance to the interior compartments of the towers. Contemporary plans indicate that the towers were to have a single elevated entrance door leading into the second floor of the tower on the Fort Henry side, although at present there appears to be a ground-floor door below the first in each case. Interior communication was by hatchways and stairs or ladders. These towers had no central pillars and the terreplein and dome arch were supported entirely by the exterior wall.

The Branch Ditch towers had no magazines as they could be supplied from Fort Henry. Originally, also, they had no barrack facilities as they were not intended for permanent occupancy. Each of them was an embrasured and top armed gun platform, functionally similar to the other Kingston towers, but regarded as an appendage of Fort Henry. They accorded it some small security but were not capable of a prolonged resistance to an attack by land or water.

Structurally, they were in some ways similar to the standard British one-gun tower, and to the one intended to be erected in advance of Fort Henry in 1841. Certainly there was no shortage of contemporary plans from which their form might have been adapted. They were the only Canadian towers without central pillars. They were apparently begun before the other Kingston towers, but were not completed until early 1848. At times work on them was stopped or delayed because of the more urgent priorities of the main harbour defence towers.

11 Photo of the base of the Fort Frederick tower, 1971, showing the structure and position of caponiers in ditch.
(Public Archives of Canada.)



Their subsequent history is in the same fashion subordinated to the importance of the structural innovation, military merit and politics of the construction and use of the other four towers.[47] The Branch Ditch towers were undertaken to meet a specific and limited need, and contribute little to an understanding of the development and deployment of this type of work.

All of the Murney, Point Frederick, Cedar Island and Shoal towers were derived from the same pattern. When completed all had many similar external features and were very much the same inside. The Murney Tower was planned, commenced and completed before the others and contained most of the salient features of the other three.

Murney Tower

The Murney Tower was constructed at a site on the western extremity of the town of Kingston. Because of its great distance from Points Henry and Frederick and the regular steamboat channel, it was never intended to be more than an auxiliary to the lake defences. This early view of the tower's role is substantiated by its intended meagre one-gun armament.[48] It was preliminarily estimated at £6,000 and the first plan, drawn in December 1845, differed only insubstantially from the final design. The only noteworthy alteration was the provision of the four caponiers and the consequent elimination of the machicolation gallery over the door.[49]

In general form the tower was a two-storey masonry structure topped by a terreplein and parapet. It was intended to be 56 ft. in exterior diameter at the base with a slight inward taper to its 36-foot-high scarp wall. The mean dimensions of the unequally proportioned exterior wall were 14 ft. toward the lake and 8 ft. on the landward side. The two interior levels of the tower were bombproofed above the barrack floor by an ashlar masonry annular arch filled above with brick or rubble masonry to the level of the ashlar platform. These gave it about 7 ft. of bombproofing in all. This arch was sustained at the centre by a solid masonry pillar 5 to 6 ft. in diameter, extending down to the foundation. The gun platform was some 6 ft. below the level of the crest of the parapet with a double masonry banquette all round.

The exterior base of the tower was provided with four equally spaced caponiers reached from the interior of the tower by passages through the wall at its base. Each loopholed caponier extended out 13 ft. 6 in. from the tower and the crest of its parabolic arch met the tower at a height of 20 ft. above the foundation, at an angle precluding its use in escalade. The bombproof caponier arch varied from 2 ft. 6 in. to 3 ft. 6 in. in thickness, and yielded an interior compartment 8 ft. x 10 ft. x 6 ft. 3 in. Each caponier was provided with 11 loopholes to enable it to command the whole ditch in conjunction with its fellows. At the Murney Point tower the ditch was intended to be 22 ft. wide on the seaward side and 18 ft. on the landward side. The dry masonry counterscarp, set at an angle of 75 degrees, was to be respectively 16 and 10 ft. high on those sides. The whole was to be provided with a glacis to protect the counterscarp and almost completely hide the caponiers. The barrack level entrance was originally intended to be reached by a ladder of movable stairs from the bottom of the ditch. For the sake of convenience, this was soon altered to a drawbridge over the ditch.

The basement of the tower was reached by a hatchway and stairs leading down through the wooden barrack level floor. The 9-foot-high basement level was permanently partitioned in brick into storerooms and a magazine leading off of a circular central passage around the pillar. The 12 ft. x 14 ft. x 7 ft. magazine was arched in brick and had a storage capacity of 114 barrels of powder when it entered service. The magazine was provided with a small light chamber reached from the central corridor and possessed a small shifting room at its entrance. The other storage areas were intended to be given over to artillery, equipment and provision stores. The caponiers were a poorly planned late addition to the tower, and three of the four were reached through the storerooms. These caponiers were separated from the interior of the tower by a solid door at the interior end of the passage through the wall and by an iron grille door at the outer end. The inner doors were flanked on each side by a musketry loophole that afforded the defenders a command of the grill-work door if a caponier were breached in an attack. A brick-lined water tank 8 ft. square was created below the basement level. It was to be supplied with water carried down from the terreplein drainage system. It was intended to be drawn up again to the barrack level by a pump for the use of the garrison in a siege.

The barrack area was 7 ft. high to the spring of the arch and of about 14-ft. radius between pillar and wall. It contained the entrance doorway, and the exterior wall was pierced at that level by three embrasures for carronades. It was provided with a boiler arrangement recessed into the wall for heating and cooking, and had two stoves, in addition, for heating. All these were intended to vent, by means of flues in the walls, to the crest of the parapet. For the most part this floor was to remain an open barrack area, though a portion was partitioned off to form an officers' room. Access to the top of the tower was by means of a narrow stairway cut through the wide part of the exterior wall from the barrack level to the parapet.

The terreplein of the Murney Tower was a regular circle, and was the only one of the large Kingston towers so formed. The terrepleins of the others were shaped in arcs to accommodate their intended ordnance. As the Murney Tower was designed for only two pieces, it was possible for both to traverse a full circle from a single pintle set at the centre of the tower. The fronts of the traversing platforms of these pieces were intended to ride on trucks resting on the banquette. The interior seaward face of the parapet was provided with three shot recesses, and the original contract plan of January 1846 envisioned the creation of a passage for a machicolation over the entrance. The completed Murney Tower was intended for a regular garrison of one officer or non-commissioned officer and 24 men and capable of housing many more in an emergency. It was in pattern the most sophisticated of all those erected in Canada and was, in effect, a small self-contained fortress.[50]

Fort Frederick Tower

A heavy earthen sea battery was also authorized for the extremity of Point Frederick as part of the building programme of 1845. Its gorge was to be defended by a loopholed masonry line wall and it was decided to erect a Martello tower in the interior of the fort as a keep and barrack for the whole position. The Point Frederick position was the chief focus of the whole harbour and dockyard defence and was allocated £20,000, over one-third of the whole emergency budget. The necessity of accommodating a large garrison to man the battery led to the construction of a three- rather than the usual two-storey tower.[51]

The Fort Frederick tower was circular in form and 60 ft. in exterior diameter. Its slightly inward-sloping scarp wall was 45 ft. high from its foundation to the crest of the parapet. The mean thicknesses of the disproportionate exterior wall were about 15 and 9 ft. toward the lake and land respectively. The wall was flanked at the base by four equally spaced caponiers identical to those at Murney Point tower. In the interior the solid circular central masonry pillar, 7 ft. in diameter in the basement and diminishing to 6 ft. at the barrack levels, helped sustain an annular ashlar masonry arch sprung over the second barrack level. This approximately 3-foot-thick arch was filled above to the level of the ashlar masonry terreplein and provided 6 ft. of vertical bombproofing. The crest of the parapet extended 6 ft. above the level of the terreplein and had a 2-foot-high banquette step at its base. The only other external defensive feature of the tower was a shallow ditch and counterscarp. As the tower was to an extent defended by the parapet of the sea battery in front, it was not afforded the same level of counterscarped defence as the Murney tower, thus permitting its musketry fire as well as its embrasured carronades to sweep the whole interior of the fort.

The tower's only outside entrance was by a door opening into the second storey, and interior access to the basement was by stairs leading down through the lower barrack floor. The basement, about 9 ft. high with a 14-ft. radius, was partitioned off into an arched brick magazine, magazine support facilities and storerooms leading off a narrow passage around the pillar in much the same manner as at the Murney Point tower. Its caponier entrances were similarly arranged and it likewise contained a cistern below this floor level.

The lower barrack floor of the tower was intended to be retained as an open room 10 ft. high with a 15-ft. radius from pillar to wall, all round. Its floor was of wood and its ceiling was formed by the wooden floor of the barrack level above. At this level the wall was pierced by three carronade embrasures in addition to the doorway, and contained a boiler heating arrangement recessed into the thickest portion of the exterior wall. It communicated with the level above by stairs cut in the outside wall. The upper barrack level was very similar to that below, except that it was intended to have four carronade embrasures and its ceiling was formed by the bombproof arch. It was about 15 ft. wide and 6 ft. high to the spring of the arch, which rose about another 4 ft. at its centre. It also contained a recessed boiler for cooking and had an officers' room partitioned off between pillar and wall. Another flight of stairs within the outer wall of the tower led up to the terreplein. This passage exited through the wall of the parapet at the top. The tower was intended to mount three pieces of ordnance, and the terreplein was accordingly shaped. The parapet was filled in concave arcs to accommodate their traverses from separate centres in the English fashion. The platforms were intended to pivot from pintles fixed in their rear and traverse by means of trucks resting on the banquette. Like the Murney tower, that at Point Frederick had three storage areas recessed into the parapet.

While the base of the Fort Frederick tower was not as well defended against artillery fire as that on Murney's Point, it was to be the most heavily armed of all the Kingston Martello towers and when finished, constituted an imposing battery keep. Through the medium of its platform ordnance, it was also a well-protected small sea battery in its own right. It was capable of firing over the parapet of the main battery into Navy Bay and the commercial harbour and sweeping most of the periphery of the low-lying point against an amphibious assault directed at Fort Frederick.[52]

Cedar Island Tower

The first of the Kingston towers to be suggested and the last to be completed was the one on Cedar Island. A tower in that location was first recommended in Sherbrooke's 1816 fortification report, and remained a constant of all subsequent defence schemes until the authorization of its construction in August 1845. Its completion was delayed into 1848 by the remoteness of its location and the need to ferry the limestone building stone from the mainland. Cedar Island was at the extreme east of the contemplated harbour defence and separated from Point Henry by the entrance to Hamilton Cove. The cove was renamed Deadman Bay after a number of workmen drowned there when a boat capsized during the building of the tower. The tower was originally intended to be located on the north end of the island to function as a sea battery and prevent a landing in the cove. In 1845, however, Colonel Holloway successfully argued for its relocation at the other end of the island where it would be better placed for the general defence of the harbour.[53]

The plans for the tower were drawn in March, and work commenced in the summer of 1846 on a two-storey tower intended to be identical with that on Murney's Point. The preliminary estimate was £6,000 but unexpected construction problems raised its final projected cost to £10,251.[54]

There were minor variations among the various plans but the completed tower appears to have been 54 ft. in basal diameter and 36 ft. high from the foundation to the crest of the parapet, with a disproportionate exterior wall having a mean thickness of 8 ft. toward Fort Henry and 14 ft. on the opposite side. It was caponiered in the fashion of the Fort Frederick and Murney towers. The first plans of March 1846 placed a machicolation gallery above the second-floor entrance door on the Fort Henry side, although the corrected plans of June of that year dispensed with it.

The altered plans contemplated constructing a tower identical in every internal feature with Murney Point tower and this would seem to be very much the design finally carried into effect.[55] The only substantial variation between the two towers occurred on the top where the Cedar Island tower followed the contoured plan of the Fort Frederick tower, as it too was intended for three pieces of ordnance traversing from separate centres.

While the tower itself was completed in 1848, its ditch and counterscarp were not added immediately. The original intention had been to surround the tower with a full ditch, counterscarp and glacis in the manner of the Murney and Point Frederick towers. By August 1849, however, this had been altered to a proposal for a partial redoubt that would leave one side of the tower exposed to gunfire from Fort Henry. This same proposal called for a musket gallery for reverse fire in the counterscarp wall with a covered passage leading to a loopholed masonry caponier set on the edge of the glacis beyond. A variation of this plan was reintroduced in May 1850.[56] Even without these external defensive features the tower was an imposing, if isolated, self-defensible sea battery for three heavy guns. The base of the tower was 50 ft. above the waterline on the narrow island, and the tower itself rose another 36 ft. above that level. While this height may have hampered the effectiveness of its fire at very close range, it was well adapted to commanding the passage into Hamilton Cove and cooperating with the main harbour defences at long ranges.[57]

Shoal Tower

The last of the Kingston towers, the Shoal Tower, was a relatively late entry into the scheme of Kingston's defences. Once suggested, however, it was accorded a high local priority. Most of the earlier defence schemes had contemplated defending the inner harbour with a battery located at Mississauga Point on the western shore. By the time of Colonel Holloway's report of 12 June 1845, that desirable position was unavailable for fortification purposes. As an alternative, he recommended forming a new nine-gun sea battery in front of the Market House of the town. He further proposed that a tower for three pieces be built on the shoal in front of the new battery. The two works he felt would "fully effect the Command of the Harbour, with its channels and anchorages, and support Fort Frederick in protecting the dockyard."[58] The harbour at that point was only about 700 yards wide. If it is remembered that, in addition to the above purposes, the two works were to protect the Rideau Canal entrance, this seemingly overelaborate sea defence becomes much more comprehensible. In the preliminary authorization of 15 August 1845, the tower was estimated at £9,000 and, despite difficulties encountered in laying its foundation, its final cost was only £8,725.[59]

Various methods of building a tower foundation on the shoal were suggested and the engineer department finally adopted a proposal to construct a coffer-dam on the ice and sink it onto the shoal.[60] It could then be pumped dry and the work commenced. The coffer-dam contract was issued on 4 March 1846, the work completed before the break-up of the ice, and the foundation commenced in the spring of that year. This whole preliminary operation added the sum of £1,196 to the cost of the tower.[61]

While the Shoal Tower is unique in its water location and in the necessary coffer-dam, it was in most other ways an unexceptional structure. From the outset it was intended to be a circular two-storey masonry tower topped by a gun platform and parapet. It was the largest of all the Kingston towers with a basal diameter of about 65 feet at the high water line. The outward-sloping masonry foundation was 82 ft. wide at the rock line 10 ft. below. The exterior wall of the tower rose some 35 ft. from the high-water line to the crest of the parapet. The mean thickness of this wall was 14 ft. at its widest point toward the harbour entrance. It declined to about 9 ft. on the opposite face. The tower had a 3-foot-thick ashlar masonry annular arch sprung above its barrack level. This was sustained by a regular solid circular pillar at the centre of the usual proportions of 7 ft. diameter in the basement and 6 ft. on the barrack floor. This tower's shorter height, only 30 ft. from the the basement floor level to the crest of the parapet, necessitated a compression of all its vertical dimensions. In consequence it had an unusually shallow layer of additional bombproofing between the crown of the arch and the terreplein. This was about one foot thick rather than the usual three. Its parapet height was also a few inches lower than normal. This same characteristic was carried to the interior where the height of the basement was 8 ft. at maximum and the barrack level a mere 5 ft. to the spring of the arch. The Shoal Tower had a single doorway opening into the barrack level through the thinnest portion of the exterior wall. Communication to the basement was by the usual stairs. The basement itself was circular and partitioned in the normal way into storerooms and an arched brick magazine. This was not recessed into the exterior wall and was somewhat smaller than usual, although the interior diameter of the whole tower basement was slightly larger than was normal at Kingston. The tower's location eliminated the need for a water cistern. The barrack floor was a few feet larger than the average and was otherwise undistinguished. It had three embrasures for carronades, an officers' room, a recessed boiler for cooking and a stairway leading off it up to the terreplein. The stairwell was cut through the thickest part of the wall and exited through the side of the parapet above. The terreplein and parapet were shaped in arcs to accommodate three pieces of ordnance traversing from separate pivots after the fashion of the Fort Frederick and Cedar Island towers. The parapet contained two shot recesses and, in one plan, provision was made for privies.[62]

The Shoal Tower's location precluded the necessity of any musketry flank defence and it was left without caponiers, loopholes, or machicoulis. Although it was ultimately susceptible to being reduced from the western shore of the harbour, such a bombardment could not occur until the town had already fallen. In point of situation it was, with the Fort Frederick tower one of the two least vulnerable and most advantageously located of all the Kingston towers.

All of the Kingston works authorized in 1845 were completed with commendable speed and at the moderate cost of £53,944, exclusive of the £6,262 voted for the Branch Ditch towers. The six towers, however, contributed nothing material to the defences of Kingston for over 14 years as, for a variety of reasons, they went unarmed for the whole period. However well chosen their sites and whatever their potential offensive and defensive military capacities, this fact weighs heavily against the real military value of their construction. The failure to arm the towers stemmed from no single conscious act of policy, but from the relatively tranquil state of Anglo-American relations between 1848 and 1861 and the underlying assumption that preparing the towers for action would have been an act of no real military consequence. The Martello towers were more neglected than the other Kingston works in the 1850s but, because this inland terminus of the Canadian defensive line was increasingly less defensible in the face of growing American power, all the works were overlooked in the general post-1850 revision of imperial and colonial defences that brought new fortifications and armament proposals, and later works for Halifax and Quebec.[63]

These Martello towers, of dubious tactical value when constructed, began to decline immediately into a state of obsolescence that was merely confirmed by the coming of the rifled gun and the massive display of American military might after 1860. These weaknesses were further articulated in the Jervois reports of 1864 and 1865.

Technically, the four main Kingston Martello towers were excellent examples of their type. In their heavy construction, exploitation of geography and use of ancillary defences against infantry and artillery assault, they incorporated every practicable expedient that would make a high-scarped masonry tower tenable in the face of attack. So anxious were the authorities to test the value of the new towers that extensive experiments were carried out at the representative Murney Tower as soon as it was completed. In these trials the caponiers proved themselves useful and efficient additions to the defence. As a flank defence the Commanding Royal Engineer attested to "their superiority over any other method that has hitherto come under my observation."[64] The ditches made an infantry attack a ponderous exercise and at breaching distance the counterscarp and glacis almost totally obscured the tower, leaving them subject only to mortar fire. So certain were the engineers of the efficacy of the towers that Major Bonnycastle, the District Commanding Engineer for Canada West, regretted: "We cannot fire at any of the towers with heavy guns, as the direction that shot would take after striking is uncertain, and might be attended with serious results to the neighbouring buildings of the works or of the Town."[65] It was also ascertained that an effective musket fire could be directed on the glacis from the parapet. Colonel Holloway submitted to the Inspector General of Fortifications that "The improved construction appears to offer manifest advantages over the ordinary Martello tower, particularly in isolated positions."[66] However calculatedly optimistic Holloway may have been, he was on the whole correct about a group of towers that were the evolutionary end-product of a half-century of experiment with that particular pattern of light permanent fortification.

While the towers were not armed on completion, the four large ones were almost immediately pressed into permanent barrack service. The "green" masonry of their interiors was dried during 1848 and they were fitted up for occupancy. In 1849 snow roofs of wood, covered with iron to prevent fires, were added to protect the masonry. By the time they were in place the main towers were already housing small numbers of men. This barrack use, which continued in one form or other until after the departure of the

British garrison in 1870, is a distinction reserved almost exclusively for the Kingston towers, as most of the others in Canada were considered unsuitable for permanent occupancy.[67] This same criticism applied at Kingston although it was not adhered to there. As early as 1849 the staff surgeon condemned the Shoal Tower for barrack purposes. In 1860 the Commanding Royal Engineer despaired of making bombproof masonry works into healthy quarters. In 1864 another engineer officer complained of the use of towers without lavatories, ablution rooms, on any conveniences for the soldiers' comfort or amusement, and recommended their occupancy be restricted to a guard in wartime. After 1860, however, no change was thought desirable or possible as the towers were in general use as married quarters.[68]

While the towers continued to perform some useful service into the 1860s, neglect, lethargy and bureaucratic inefficiency combined to prevent their effective arming until after the termination of the *Trent* affair of 1861-62. The arming process commenced with a short-lived controversy between the Commanding Royal Engineer and the officer commanding the Royal Artillery. As early as August 1846, Colonel Holloway, the engineer, recommended that the proposed towers not be armed with the heavy 56-pounder or 8-inch shell guns lest they be taken and turned against Fort Henry or the naval establishment. To prevent this possibility, he proposed arming them with 24-pounder guns and light howitzers. The officer commanding the artillery, on the other hand, was anxious to extend the offensive power and range of the tower guns against shipping and overrode the worst fears of Holloway's conservative assessment. He proposed a compromise armament composed mainly of 32-pounder guns of 56 cwt. The balanced power, range and facility for rapid fire of this version of the 32-pounder made it particularly effective against distant shipping. At the same time he proposed 32-pounder carronades for the tower interiors so as to maintain a uniformity of armament calibre.[69]

The decision rested with the artillery, and this 32-pounder ordnance was ordered placed on the towers before the roofs were put on in 1849. By 1850, seven 32-pounder guns were reported on the four main towers and fourteen 32-pounder carronades within them. In addition there was a 32-pounder carronade on top of each of the Branch Ditch towers.[70] These were the guns and carronades that, for the most part, later constituted the mounted ordnance of the towers, and on the whole, it appears that they were judiciously chosen to meet the particular geographical and other defensive peculiarities of Kingston.

All the pieces were useless without proper carriages, and in addition, the guns required fitted traversing platforms and racers to be effective. The carronade carriages were not difficult to build and were readily available from a quantity in store at Quebec. Serious problems developed with the gun mountings, however; these had to be constructed in England from drawings and adapted to meet the separate peculiarities of each work. This practice was a general feature of preparing ordnance for colonial works and while it may have produced a certain uniformity of pattern and quality, it was at best a cumbersome procedure. In the case of the Kingston Martello towers, all the difficulties were aggravated by their unusual dimensions.

The towers had been commenced before common pattern platform plans were accepted by the Royal Carriage Department in England, and the engineers in Canada simply assumed that these plans would be altered to suit the needs of the towers. The first plans were submitted home on that basis. They were inaccurately drawn but, even when corrected drawings were returned to England, the Royal Carriage Department quibbled over the specifications as an excuse to avoid making the necessary alterations in the platform pattern. No solution was reached until early 1852, after a lengthy and involved dispute had occurred, and then it was decided to alter the masonry of the towers rather than the wooden gun platforms. Although the Master General was moved to pen some caustic criticism of the lack of cooperation among the branches of the Ordnance, this wasteful travesty on efficiency was not properly corrected.[71]

Even this unsatisfactory resolution of the controversy did not quickly produce the necessary traversing platforms, as British domestic defence requirements took priority. They were not delivered in Kingston until 1859, seven years after their authorization.[72] In the meantime little could be done to prepare the towers for the reception of the traversing platforms and the little that was done was incorrect. The pintles and racers prepared on the Fort Frederick and Cedar Island towers were adapted for the ordinary, not the approved shorter dwarf, platforms. The necessary subsequent alterations consumed more time, and the tops of the Kingston towers were not finally armed until the second half of 1862 after a further three-year delay. This delay was occasioned by a shortage of the funds necessary to raise stone drums on the terrepleins to suit the new traversing platforms, converting of the works to the new style of raised racers, and then waiting for the new hollow-soled platform trucks to fit the racers. The habit of procrastination with regard to these towers was so deeply ingrained that not even the *Trent* affair moved the authorities to hurry their full preparation for war.[73] It is difficult to believe that the neglect and inefficiency chronicled above would have been allowed to persist had the towers been deemed of any great value.

By November 1862, although some of the pieces were not yet in a usable state,[74] the towers were armed as follows:

East Branch Ditch Tower	one 24-pdr. gun on top
West Branch Ditch Tower	one 24-pdr. gun on top
Fort Frederick Tower	two 32-pdr. guns on top six 32-pdr. carronades within
Cedar Island Tower	two 32-pdr. guns on top two 32-pdr. carronades within
Shoal Tower	two 32-pdr. guns on top two 32-pdr. carronades within
Murney Tower	one 32-pdr. gun on top two 32-pdr. carronades within.[75]

By February 1863 a third 32-pounder gun had been mounted on top of each of the Fort Frederick, Cedar Island and Shoal towers, and by 1866 another 32-pounder carronade had been added to each of the last two towers. The 24-pounder gun mounted on the Murney Point tower during the *Trent* affair made a brief reappearance in the ordnance return for that tower after 1863, but had disappeared by 1866. All of the guns on top were mounted on dwarf traversing platforms moving on raised racers and matching hollow-soled trucks. The carronades within were placed on wooden ground platforms.[76] The magazines of the four main towers were supplied with small quantities of powder when they were armed. Even though these towers were armed and equipped by 1863, it does not appear that they could even be test-fired until the old wooden snow roofs were replaced with more functional ones about 1867. The new snow roofs were designed to be quickly and easily jettisoned into the ditch in an emergency but it is difficult to see why. Such a procedure would simply have blocked up the caponiers and provided an attacker with cover and means of escalading the tower, as the ditches were not wide enough for the roof segments to fall flat.[77]

Although the Kingston Martello towers were finally fully armed by 1863 some 14 years after their completion, any extended analysis of their tactical merits becomes futile as by that date their military obsolescence was generally recognized. As early as 1855 Colonel Ord's report on the defence of Canada recognized the limited utility of the towers and, in fact, of all the Kingston defences. While acknowledging the necessity of an attacker's being well supplied with artillery to breach them, he pointed out that their orientation to the harbour and dockyard would necessitate their dependence on an effective field force or a naval flotilla to resist an enemy in force on land. In both of those instances the works would have been largely superfluous. Ord's assessment was a polite expression of the fact that the towers were useless against all but a hostile naval armada doggedly and unimaginatively plodding in to force the harbour.[78]

Even this limited role was denied them in the somewhat later report of Captain Noble, R. E., in which he pointed out that with the introduction of the new rifled guns, with their longer range and greater accuracy, the harbour and naval dockyard were vulnerable to bombardment from as far out as Wolfe and Garden islands, beyond the range of the towers' defensive 32-pounder smoothbore guns. Kingston was so vulnerable that he recommended that the valuable naval stores be maintained afloat above the Cataraqui bridge, beyond the range of the new guns.[79]

It would appear that these towers only came to be armed at all through reflex action and in the hope that they might form a supplementary adjunct to an all-encompassing defensive system at some future date.[80] Such a system was suggested by Colonel Jervois in his 1865 examination of Canadian defences, although he felt that rifled ordnance would quickly silence the en barbette tower guns. He went further to say that even in the days before rifled ordnance, the towers could never have afforded efficient protection to the naval establishment, even from a water-borne attack.[81] Given the dates of the towers' arming and the prior recognition of the effectiveness of rifled guns, it is evident that these towers were not considered capable of making a substantial contribution even to the defence of Kingston harbour.

In 1845 the Kingston Martello towers provided a cheap, easy, and obvious answer to a thorny and vexing defensive problem. They were authorized and constructed to fulfil political, psychological and financial rather than primarily military needs. It is indisputable that Kingston required some sort of permanent protection at least to delay an attacker, and that the towers built there embodied the most effective and defensible design of such permanent works. However, as they were geographically vulnerable from land and lake, they would have been incapable of resisting the overwhelming tide of military and naval power that could have been brought to bear against them by the industrializing United States after 1848. The four large Kingston Martello towers were in essence built to salve the conscience of a niggardly and schizophrenic imperialism. All were the products of an era when old colonial loyalties were breaking down and the British government was seeking alternatives to the massive permanent fortifications which had been such a dismal and costly failure.

Decline and Obsolescence: 1846-71

In the years between the end of the Oregon crisis of 1846 and the withdrawal of British troops from the interior of the new Dominion of Canada in 1871, all of the Martello towers in British North America became militarily obsolete. Over this 25-year period they fell prey to changes in a variety of the strategic and technological factors that had brought them into existence in an earlier era. Among these were the introduction of steam and ironclad war vessels and heavier offensive smoothbore ordnance, an evaporating British interest in defending the interior of British North America, an ever more widely accessible military frontier, and the sheer mass of the American army after 1861. The single most important influence, however, was the range, accuracy and breaching power of the new rifled guns introduced into general military service after 1860. This type of ordnance spelled the beginning of the end for exposed masonry works of all types. It altered the whole basis of attack and defence and drove the world's fortifications into heavy subterranean casemates and behind massive earthworks.

The beginning of the decline of Martello towers can be marked in the December 1846 decision of the Secretary of State for War and the Colonies that, "all new works which had not at that time been commenced, should be deferred," although the Kingston towers were allowed to be completed because otherwise the money already spent on them would be wasted.[1] The new Liberal ministry was completely reconciled to the eventual independence of the colonies with a concomitant increase in local responsibility for defence. By 1852 the British regular forces had been quietly but considerably reduced until they numbered only about 7,000, all ranks. In March 1851 the failure of the former policy of a proliferation of works was formalized with the concentration of most of the remaining troops within the existing important fortified points in the Canadas and the Maritimes. The withdrawal was accelerated by the outbreak of the Crimean War in 1854 and the period of Anglo-American tranquility ushered in by the Reciprocity Treaty of the same year. It was not counterbalanced until the *Trent* affair of 1861 instigated a rapid bolstering of British American defences. Great Britain never denied her ultimate obligation to defend her American colonies, but after 1846 it became evident that there would be no easy expenditures on improving fortifications at points other than the imperial naval station at Halifax, and no works of any kind to sustain the previously discredited theory of extended defences.[2]

While official policy made it certain that no more Martello towers would be constructed in British North America, all of the existing ones at Halifax, Saint John, Quebec City and Kingston were in places that continued to have British garrisons and were consequently kept at the normal maintenance level of permanent works in peacetime. The newly finished and roofed but unarmed Kingston towers required little upkeep, although they were in fairly constant barrack service. Some minor improvements were even made there. To facilitate access to it, the Cedar Island tower was equipped with a landing wharf for the use of the detachment boat in 1849, and in 1854 a platform was constructed at the base of the Shoal Tower below the entrance so the boat would be removed from the water.[3] It is to be presumed that certain minimal barrack facilities were added at an early date. The Branch Ditch towers were not originally intended as barracks, but by 1854 they contained small guard detachments. By 1859 they were occupied and carried on the rolls as permanent barracks in the same manner as the detached towers and must have been provided with similar facilities. The towers were reported in good general repair in the various inspection reports. By 1861, however, the wooden joists and planks of the powder magazines were in a very decayed state because of the poor ventilation of the basements of the towers.[4] These were most likely repaired before powder was lodged in them after 1865.[5] Periodic pointing of all the towers was carried out and, apparently, about 1867, the snow roofs of all four main towers were reconstructed so as to permit firing the guns.[6]

In the 1850s the occupancy figures of the Kingston towers fluctuated widely due to the number of troops stationed there and the quantity of other accommodation available. These figures varied from 1,047 men in 1850 to a mere 230 of the Royal Canadian Rifles in 1860.[7] Men of this unit, a British-officered regiment raised in Canada for Canadian service only, were the chief occupiers of the towers between 1855 and the regiment's disbandment in 1870. After 1860 the towers for the most part housed soldiers of this unit with their wives and children. In 1860 the major commanding the Royal Engineers at Kingston expressed fear for the wooden fitting of the towers from "allowing the floors and joists of these structures to be saturated with excremantary [*sic*] solutions which numbers of soldiers' children in one room frequently and naturally void." Despite this warning, however, and his suggestion that each tower be occupied by a single family, a lack of suitable alternative married quarters led to a rejection of his advice and their continuation in multiple-family occupancy.[8] The lack of amenities of the bombproof towers, catalogued in 1863, and the crowding of several families into their confined spaces must have produced abominable living conditions. In November of 1869, for example, they were occupied as follows:

Each Branch Ditch tower: three soldiers and their wives.

Cedar Island tower: one soldier and wife in a separate room and five soldiers with their wives in the barrack rooms.

Fort Frederick tower: one soldier and wife in a separate room and eleven soldiers with their wives in the barrack rooms.

Shoal Tower: one soldier and wife in a separate room and four soldiers with their wives in the barrack room.
Murney Tower: one soldier and wife in a separate room and four soldiers with their wives in the barrack room.[9]

Although it is fair to assume that the more remote and isolated of the towers were no longer used after the British withdrawal in 1870, the Murney Tower was in military barrack use as late at 1882, as a daughter was born to a soldier stationed there in that year. It may have been used by some of the soldiers attached to the militia training school that was founded at Kingston in 1871.[10] All of the Kingston towers were transferred intact to the government of the Dominion of Canada in August 1870.[11] The Canadian government maintained no proper regular garrison at Kingston and had little use for the towers. It may be assumed that they immediately slipped into the process of slow decay and neglect that characterized Canadian treatment of all their inherited British North American works. All the towers, however, retained their armament though much of it appears to have been dismounted.

The four Quebec towers experienced somewhat the same pattern of maintenance and use as those at Kingston, although they were less used as permanent barracks and the deterioration of two of them was accelerated by accident. They were apparently uninhabited for a lengthy period after 1815, but for some years after 1846 each was placed in charge of a resident tower-keeper responsible for airing them and maintaining winter fires when they were not occupied by troops. These jobs were valued sinecures allocated to pensioners of the Royal Artillery.[12] Such measures undoubtedly contributed to the reportedly good general repair of the towers, as did occasional pointing of the masonry and renewal of badly decayed wooden fittings. The most persistent defect in their condition was the extensive presence of dry rot in the wooden floors over the water tanks and basement storage areas. This was again, apparently, the result of poor ventilation within the tower and the lack of funds to undertake the general renewal of the floors. This extended neglect is indicated by the submission of a substantially similar complaint in 1852 and again in 1869, with no indication of its general intermediate redress.[13]

A more severe detriment to the serviceability of towers 3 and 4 occurred in the form of fires that swept their upper works. On 16 May 1857 the roof and parapet of tower 4 were destroyed in that manner, and although temporary repairs were undertaken to secure its platform and arch during the ensuing winter, the Ordnance department failed to secure approval of an estimate for permanent repairs until 1862. On 6 June of that year the roof of tower 3 was destroyed by fire and the cut-stone work of the parapet greatly damaged. A new snow roof was immediately supplied, and both it and the new roof of tower 4 were covered with tin as a fireproofing measure. The parapet of tower 3 was not renewed because future improvements to meet the demands of rifled guns might require an alteration in its shape. The gun mountings were not replaced on either tower.[14]

The Quebec Martello towers appear to have been little occupied as barracks before 1860, though in the summer of that year they were being occupied by troops, about 20 to a tower. These soldiers were probably militiamen stationed there for the summer only. By 1863 some of them appear to have been in permanent barrack use by a few artillerymen and married soldiers.[15] Living conditions were not the best, for an 1864 engineer report said, *They are not regularly fitted up as barracks. Care should be taken to provide proper privies, small ablution rooms, etc. for these towers when used as Barracks. . . . There is no ventilation other than that provided by the windows. Stores are situated in the basement of each tower. There are no kitchens; boilers in the towers afford the only means of cooking. There are wells to Nos. 1, 2 and 4. No. 3 has to be supplied by water carts with water. . . . Rules should also be established to prevent rubbish being thrown into the ditch and creating a nuisance which might lead to disease. Putrid vegetable matter and cinders, etc. were observed in the ditches and around the towers at Quebec when visited.*[16]

At the time of the above observation, tower 1 designed for 11 men housed one, and tower 4 with the same capacity, accommodated three men. Of towers 2 and 3, with a maximum regular barrack capacity of 24 men each, tower 2 held four and tower 3, three men. All of these maximum figures were drawn at the revised space entitlement of 600 cubic feet per man. The use of the Quebec towers as barracks in 1863 may indicate a lasting alteration in their use, or may merely reflect a temporary shortage of barracks resulting from the Canadian troop build-up of 1861-62. Although none of the tower magazines was supplied with powder in the 1860s, tower 1 was pressed into temporary service as an artillery laboratory from 1864 to 1867, after an explosion in the old facility.[17]

With the exception of the top of tower 3, the Quebec Martello towers were maintained in tolerable repair until 1870 by the British government. In the same period towers 1 and 2 retained their armament while on the others it was not replaced after it had been accidentally destroyed. In the 1860s the towers rendered more recorded barrack service than they had since 1815. Before the end of 1871 these towers were also handed over to the care of the Canadian government.

The Carleton Martello tower at Saint John was perhaps the most badly maintained of all those in Canada because of its physical isolation and its location at an auxiliary military point of small strategic consequence. Not until the early 1860s did Saint John absorb the renewed attention of the British military. Even at that date the emphasis was on heavy sea defences to meet the rifled guns of the American navy rather than refurbishing the city's obsolete land defences. In 1866 a flurry of Fenian activity caused some brief attention to be given to the Carleton tower but this was illustrative more of its pathetic inadequacy than of its strength.

Nothing appears to have been done at the Carleton tower between its repair in the early 1840s and 1859, when the worst of its defects were corrected and it was pressed into service as a temporary repository for the powder formerly stored in the Fort Howe magazine, which was then undergoing repair.[18] In the 1850s this tower was listed in fairly good general repair, though the exterior required painting and the roof was old and leaky.[19] Painting was a more frequent requirement for towers exposed to the salt air of the Atlantic coast than for those in the interior, and was a perennial complaint in Halifax and Saint John.

Due to its dampness, the use of the tower for powder storage was only intended to be a temporary expedient. Events altered this intention and it remained in magazine service until 1866. During the *Trent* affair of 1861-62 an extra £5,000 worth of ammunition and warlike stores were shipped to Saint John and stored in the tower. In consequence the ventilation was improved and the walls lined to admit the close storage of powder barrels. This *de facto* conversion of the tower to a magazine used both its basement and barrack floors. During the four-year period 1862-66 the whole of the smallarms ammunition for the province of New Brunswick, for the use of both the regular and militia forces, was lodged on the barrack floor of the Carleton tower. This dangerous practice was terminated in the spring of 1866 when the military took cognizance of the fact that the tower was an isolated and undefended magazine two miles in advance of the city on its vulnerable western flank.[20]

Between 1860 and 1865 the Carleton tower was often touted in the numerous defence reports of those years as an active, if subsidiary, component of the harbour defence works. Saint John had come to be viewed as a valuable offensive base in the hands of an enemy force operating against Nova Scotia, but, because its retention was a preventive rather than a positively useful measure, nothing of enduring value was accomplished in the way of new fortifications to meet imperial obligations.

The last 19th-century use of the Carleton tower derived from very local circumstances. The American invasion feared as a consequence of a victory of the Union Army in the American Civil War evaporated quickly in the summer of 1865 as most of the large army was quickly disbanded. At the same time, however, the Fenian Brotherhood, an Irish-American secret society, began planning to strike a military blow against British North America as a measure of revenge against British oppression in Ireland. Most of the colonies were little disturbed, and the few raids actually mounted in 1866 were quickly defeated. In New Brunswick, which felt itself especially vulnerable to Fenians reported massing along the Maine border in March 1866, considerable military preparations were undertaken. British naval and military forces in and around the province were increased and the militia embodied.[21] Most of the static defénsive preparations centred on Saint John, as it was commercial centre of the province and the most tangible prize within the grasp of Fenian raiders. A land attack from the west was anticipated and a defensive line contemplated behind the town, stretching from the Negro Point battery at the harbour mouth, to the Yorkshire Tavern, commanding the junction of the Fredericton and St. Andrews roads. The Carleton tower was to be improved and incorporated as an intermediate point in this line, as a keep to a well-armed redoubt to be constructed around it. The available military resources were so inadequate and the line so extended that it was hardly assumed to be proof against even a desultory assault.[22]

The acceptance of this proposal immediately produced feverish activity at the tower. Colonel Cole ordered it repaired and armed with the only available ordnance, four obsolete 18-pounder carronades. No carriages were available for them, however, and preparations were instead made for 32-pounders. These were not immediately available and the tower was not armed until the short-lived crisis was safely past and the Fenians dispersed. Two long 32-pounder guns were eventually provided. The local engineer officer discovered that the windows of the tower were not adapted as embrasures and could not safely be altered until the powder was removed. Once this was done the military preparations proceeded more expeditiously. By May 1866 the conical snow roof had been removed, the terreplein and parapet waterproofed, and a temporary musketproof machicolation affixed over the door. The tower was also equipped with musketproof loopholed shutters and doors and the interior fitted out as a barracks. The permanent wooden stairs were replaced by removable ones and latrine and cooking facilities provided nearby. The above alterations cost a total of £187, and most were accomplished after the dispersal of the Fenians on 14 April. The tower continued to be occupied as a barrack until early 1869.[23] The Carleton tower's ephemeral prospect of martial glory in 1866 terminated its regular service. With the British withdrawal, it passed under the aegis of the Canadian government, which for decades thereafter found it of no use.

While the Martello towers at Kingston, Quebec and Saint John passed into a recognizedly deserved military oblivion after 1865, those at Halifax, while no more valuable, escaped Canadian control and a similar fate after 1870. They were retained as components of the defences of the British naval station at Halifax. The fact of their location within the precincts of an imperial station, one to be defended irrespective of the fate of British America as a whole, added little to the quality of maintenance of these increasingly obsolete works in the period 1846-71. It did, however, contribute in large measure to some of them being adapted and continued in subsidiary military roles in the new defensive era of rifled ordnance that began in 1860. This use persisted long after the British North American Martello towers in Canadian hands ceased to be of any military value whatsoever.

Measures to improve the Halifax defences were under fairly constant consideration between 1853 and 1865 by a succession of committees. The continuing value of the towers as unimproved independent military works was cast into doubt as early as 1855 and their limitations magnified in each succeeding report. No one, however, was prepared to dismiss all of them out of hand, and various expedients were proposed to allow their continuing service. For the most part they were retained in their habitual state of repair (or, more properly, disrepair) until some definite course of action could be decided for them.[24]

The least doubt attended the fate of the Sherbrooke Tower, which from the date of its completion was used primarily as a lighthouse. Its three 24-pounder guns were still in place in 1864, but because of its useless location, feeble construction and exposed position, its military value was repeatedly dismissed and it became increasingly subordinated to its civilian function.[25] Repairs and maintenance on the tower proper continued to be a military responsibility into the 1860s while the light was maintained by the local government.[26] The military carried out some small repairs in the 1850s and in 1860 some external measures were taken to protect it from the encroachments of the sea.[27] The Sherbrooke Tower was always regarded as the least useful of the Halifax towers, but its very inadequacy was a contributory factor in its virginal survival long after its fellows had been altered or demolished to serve newer military ends. The Sherbrooke Tower was the least militarily important of the Halifax towers. The Prince of Wales Tower on the other hand, was generally reckoned the most useful of them. Its valuable location resulted in its eventually undergoing more alteration and rendering greater and more extended service than any of the others.

Through the 1840s and 1850s this tower stood in a vacant and dilapidated state. It had been proposed to give it a new roof in 1849, but by 1859 it was badly in need of both external and internal repairs, including exterior pointing and a renewal of its floors and interior wooden fitments. Some of these repairs were authorized for 1860, but in January of that year the commanding major general in Nova Scotia proposed that a partial conversion of the basement level to a magazine be carried out in conjunction with them. Such a magazine, with a capacity of 804 barrels of powder, would, he felt, amply fill the anticipated needs of the three sea batteries on Point Pleasant and save the expense of building a whole new magazine.[28] This alteration was approved for completion in the 1861-62 estimate, but was delayed till 1862 by the Inspector General of Fortification's order for the total conversion of the basement for 1,250 barrels of powder.[29]

This revamping was commenced on 10 September 1861 and rushed to completion by 30 April 1862.[30] It resulted in a concrete and cement basement floor with a bombproof brick arch above, and the partitioning off in rubble masonry of a shifting room at the basement entrance door. The smaller central room of the tower was arched and converted into an illuminating room for the magazine. The larger room was lined with wood, provided with barrel storage racks, and provided with a wooden partition to separate the depot and expense magazines. It appears that a second floor entrance was also opened at that time above the basement door to preclude the necessity of interfering with the magazines in order to gain access to the barrack level. The wooden cupola over the terreplein hatchway was replaced with a bombproof dome. The total basement conversion precluded any further flank defence from musketry loopholes at that level, and they were replaced by four machicolation galleries extending from the parapet. the incorporation of the tower into a splinter-proof barrack redoubt to that end the old terreplein ordnance which had been removed to facilitate the conversion was eventually replaced by four 32-pounder guns en barbette, on traversing platforms. A controversy extending into 1863 ensued over the type and shape of the gun mountings to be used, and the guns may not have been placed until 1864. By August of that year all work was complete and the tower made fully ready for magazine service.[31]

It had been proposed by the Commanding Royal Engineer to accompany the magazine conversion with the incorporation of the tower into a splinter-proof barrack redoubt to house the garrisons of the batteries and protect the tower from hostile gunfire. This work was not done, and the converted tower remained fully exposed to naval gunfire at 1,200 yards range. The tower was thus left in such a dangerous situation that in August 1864 Colonel Westmacott urged that "nothing but necessity can justify the use of this tower as a depot magazine in so advanced a position." The necessity was present, however, and as late as 1881 the tower was still serving as a major powder repository for the batteries of rifled guns on Point Pleasant.[32]

This tower had never regularly served as a barrack before its conversion, and afterwards any such general use was precluded by the question of the security of the powder. Storerooms were built on the barrack level as part of the conversion and a caretaker's quarters added later. The guard detachment on the point appears to have preferred living in a wooden guardhouse erected nearby, but for indeterminate periods before 1876 and after 1881, a corporal's guard was lodged within the tower to watch over the magazine.[33]

The Prince of Wales Tower has a longer history of independent service than any other Martello tower, but it underwent no more important changes or alterations in usage subsequent to 1864. In 1891 the British military authorities considered converting the tower into a range- and position-finding station for the Point Pleasant batteries, but this was not done and the tower was passed intact to the Canadian government on the departure of the British army in 1906.[34]

While the Prince of Wales Tower retained its structural integrity and a semblance of an independent military role through the remodeling of the Halifax defences in the 1860s, the other three Halifax towers were not so fortunate. All were located at points required for the new defenses, and the York Redoubt and Fort Clarence towers had their functions very much subordinated within these new works, while that on Georges Island was slated for demolition.

The York Redoubt tower was maintained in fair condition until the 1850s because of its signal function, and between 1855 and 1860 it was repaired, pointed and provided with a new asphalt lower floor as part of a generally revitalized maintenance program for the Halifax towers. This work was a prelude to its incorporation into the new York Redoubt position that was constructed there between 1865 and 1875.[35]

The obsolete 24-pounder guns on the old York Redoubt battery were approved for replacement as early as 1853, and, though this was not immediately done, the fortification reports of the 1860s recommended the renewal and enlargement of the whole position in masonry for rifled guns. This new and powerful sea battery was first intended to be defended in the rear merely by a wooden stockade, but for better security this specification was altered to a masonry wall to be built on a line intersecting the position of the tower. The latter was provided with two concrete loopholed caponiers to throw an exterior flanking fire on this wall. At the same time, between 1870 and 1875, the old wooden parapet was apparently replaced with one of brick. This new addition incorporated two machicolation galleries, one facing into the work and the other outward. Whatever the new defensive utility of the reconstructed tower, it mounted no ordnance thereafter and appears to have continued to function primarily as a semaphore station. It does not appear to have been bombproof, and as a mere concrete-sheathed musketry gallery it certainly by then no longer fulfilled its original role as a defensible gun platform and keep for the whole redoubt.[36]

Even this subordinate military function was transitory, for in the 1880s and 1890s the redoubt was expanded again. After that the tower stood in the centre of the parade of the fort and the wall it enfiladed was cut down. In the 1890s the upper part of the tower was gutted by fire, leaving only the lower floor with its caponiers intact. This portion was roofed over and later used for storage. It too was handed over to the Canadian government in 1906.[37]

Like the York Redoubt tower, that at Fort Clarence found a continuing and marginally useful role when it was subordinated within a newer and heavier work. Its state of repair was improved in the latter half of the 1850s, and until 1863 this obsolete tower continued to provide the chief land defence of the newly rearmed and enlarged Fort Clarence sea battery below. In March of that year the War Office approved the entire reconstruction of Fort Clarence in masonry at an estimated cost of £55,835. The new rifled guns of the battery were to be mounted in bombproof casemates and the old earthen redoubt demolished and replaced by a fully revetted redoubt with a strong profile. The Martello tower was retained within the new work, although the costly reconstruction had altered its role.[38]

The modifications to Fort Clarence were well under way by 1864 and were apparently completed by 1867. By that date the top level of the three-storey tower was removed to reduce it below the level of the new redoubt and thus afford it some protection from gunfire. At the same time the middle or ground level was made into barrack accommodation for 18 men and the basement was provided with a bombproof brick arch above and converted into a magazine to hold 650 barrels of powder. The new magazine had its own subterranean entrance while the old north side entrance to the barrack floor was retained. No ordnance was mounted on the tower after its reconstruction, and it surrendered its offensive role for magazine and barrack support functions within the new casemated sea battery and redoubt.[39]

The Fort Clarence tower was once again reduced in 1889 when its unbombproofed barrack floor was removed and alternative accommodation provided in the battery casemates. Only the magazine portion was left, and it was apparently still extant at the end of World War II. Although this tower continued in service for many years after 1867 that date clearly marks the end of its usefulness as an active defensive entity.[40]

While it was possible to retain the Martello tower within the reformed Fort Clarence, the same was not true on Georges Island where space was at more of a premium. The Georges Island tower was maintained in fair repair through the 1850s and into the 1860s. The island itself remained the key to the harbour defences. As early as 1853 the upgrading of its battery ordnance was approved by the Inspector General of Fortifications. This minor alteration soon gave way to schemes for the revision of the batteries themselves. All of these early reports visualized a continuing function for the tower, first as a ready-made *place d'armes* and later as an unarmed magazine and artillery store within a work of strong profile. Proposals to retain the tower did not outline the end of the 1850s and the coming of rifled guns. In 1861 it was dismissed as small, feeble and not defensible, and in 1864 Colonel Westmacott said it was obsolete and would form no part of the massive new works planned for the island. Again in 1865 Lieutenant Colonel Jervois advocated its removal and replacement by a bombproof barracks. Its replacement did not occur immediately but, though the tower was not demolished until about 1877, it was not altered nor did it perform any useful function after the mid-1860s.[41]

To an extent the Halifax Martello towers were abandoned, destroyed or altered in structure and function according to the same chance factors of location, tactical expediency, and local circumstances that had first brought them into existence. In various guises four of them survived the great upheavals in fortification technology in the 1860s and the succeeding decade, and three of them even continued to function in a subsidiary military way. The prolongation of the usefulness of the Halifax towers into a new generation of fortification was primarily a product of the unique circumstance of the British retention of Halifax as a naval base after the general imperial withdrawal from British North America in 1871. However, their changing role and anticipated military value between 1850 and 1870 are representative of the continuing process of general military obsolescence of Martello towers in those years.

While many circumstances could influence the tenability of a Martello tower in the face of an attack, its utility was primarily a function of the artillery that could be brought to bear on it, as a properly defended tower was generally conceded to present a difficult obstacle to unaided infantry assault. The British North American Martello towers had been constructed to meet the challenge of smoothbore naval guns of 24- to 42-pounder weight and land service ordnance of lighter calibre.

Additionally, although their defects and increased vulnerability were recognized, they remained respectable defensive works through the introduction into service of the heaviest feasible calibre of smoothbore guns and various refinements in ammunition in the 1840s and early 1850s.

It was generally assumed that the redoubted tower could hope in some manner to meet the defensive requirements of the best smoothbore guns with their high degree of inaccuracy and limited range. But towers were rendered obsolete in very short order by the introduction of the rifled gun, which at a stroke corrected both defects of the earlier pieces. Experiments both in the techniques of rifling and the use of the tougher wrought iron in preference to the more brittle cast iron in the manufacture of ordnance were under way throughout the western world in the 1840s and 1850s, but the wrought iron rifled gun was not taken into general military service until about 1860.[42] With an accuracy that permitted breaching of works by repeated hits on the same point and an effective range that allowed it to be operated beyond the reach of contemporary smoothbore pieces, the rifled gun at once reduced the value of exposed masonry works. At the same time it forced the introduction of heavy rifled defensive ordnance, and in some instances forced lines of defence to be so extensive and far removed from the objects they were to guard that their cost was unendurable and their construction impracticable.

This latter factor operated in British North America where, in the prevailing mood of British colonial and military policy of the later 1860s, the new defensive systems proposed by Jervois in 1865 for the harbour of Kingston, and that later planned for the north shore of the St. Lawrence before Quebec, were never built.[43] Such long-term ramifications of the new age of ordnance go far beyond the case of the Martello towers, whose obsolescence before the rifled gun was conceded by the British military establishment in and after 1860.

In August of that year an uncovered brick Martello tower on the Sussex coast of England was totally reduced by shell-fire in an experiment to test the breaching capacities of the new rifled Armstrong guns. It was ascertained that these guns retained a high capacity at ranges above 1,000 yards and the tower was rendered indefensible with the firing of less than 27 rounds. A comparative attempt to breach another similar tower with heavy smoothbore guns at similar ranges produced a negligible effect, "both accuracy of fire and velocity of the missiles being quite deficient for such a range." The superior virtues of the rifled guns were less than absolutely conceded against fully covered scarps or when fired from naval vessels, but their greater efficacy against a variety of works was admitted and their effect on Martello towers explicitly demonstrated.[44] If any further practical demonstration of the power of rifled guns was needed, it was being simultaneously provided by the effective use of Armstrong guns in attacks on the Taku Forts in China. This lesson was reinforced less than two years later by the reduction of the heavily casemated Fort Pulaski in Georgia by the rifled guns of the Union Army.[45] Heavy rifled guns of a variety of types and sizes were in active use in American land and sea service after 1861,[46] and it was these weapons that the evolving defences of British North America were designed to meet as the United States renewed her hostile posture with the *Trent* affair of that year.

The massive quantitative and qualitative demonstration of weaponry in the United States ended nearly a decade of uncertainty as to the adequacy of the existing defences of the maritime areas of British North America. Together with the issue of the first American contract for an ironclad war vessel in 1861,[47] the rifled gun shortly produced a complete alteration in the character of those works. The adaptation of existing defences was most evident at the important and exposed Halifax port and naval base and at the port of Saint John, New Brunswick, which was useful as a staging port. The necessity of change, however, was also progressively articulated at Quebec, where a number of new works were hesitantly projected and the Lévis forts actually begun. It terminated at Kingston, where further defensive measures were rejected by a conscious act of policy. Rifled guns completely changed the nature of British North American fortifications in the four-year period between the outbreak of the American Civil War in 1861 and the presentation of the Jervois report in 1865, and almost incidentally rendered Martello towers militarily superfluous.

The first general condemnation of Martello towers in British America occurred at Halifax on 1 January 1862, when Colonel Westmacott, the Commanding Royal Engineer, dismissed all of the existing works with the exception of the Citadel, because they dated from the 1796-1812 period, "and though doubtless valuable at that time, are altogether unsuited to cope with modern projectiles, or meet the present requirements of war."[48] All, with the exception of the one on Point Pleasant, were classed as being small, feeble and indefensible. The Prince of Wales Tower appears to have been excepted because it was already undergoing the expensive magazine conversion. Westmacott somewhat tardily condemned it in 1864 as being too exposed to be of use in that capacity.[49] He went on to recommend a whole new system of harbour defence works that encompassed a revision and entrenchment of the existing batteries and the creation of new ones to fully control the harbour channel.

Westmacott's critique and proposal was the penultimate step in a series of evaluations of the harbour defences that had commenced in 1853 and resulted, on 6 February 1863, in War Office approval of a whole new system of harbour defences for Halifax.[50] A majority of the pre-1863 reports had tentatively recommended retention of the Martello towers in any new system, sometimes in their original roles, but it was evident that they could play no more than very subsidiary roles in conjunction with the heavily redoubted and casemated sea batteries for the new rifled guns.[51] Westmacott's plan and Jervois' further assessment of 1865 ended any possibility of an active offensive military role for the Halifax towers. By that time all of them (except, for special reasons, the Prince of Wales Tower) had been disarmed. They were of little consequence in a tripartite system whose rifled guns would interdict the harbour approaches at York Redoubt, on a Point Pleasant-Ives Point axis, and the Georges Island-Fort Clarence inner line. Jervois deemed them so superfluous that he recommended the demolition of the Georges Island, Fort Clarence and Sherbrooke towers.[52] Though the new works were not entirely completed and armed until after 1875,[53] and only the Georges Island tower was actually totally eliminated, by 1865 at the latest, all five Halifax Martello towers had clearly lost their original role as effective self-defensible elevated gun platforms capable of independently withstanding artillery attack and making significant contribution to the defence of the city and harbour of Halifax.

The incorporation of some of the Halifax towers in the new British defensive systems, completed after 1871 and maintained until 1906, somewhat obscures their actual point of obsolescence. This anomalous process, which was epitomized by the Prince of Wales Tower's dubious distinction of mounting the last smoothbore guns in Halifax, was not repeated. Elsewhere in British North America towers became manifestly obsolete with the introduction of rifled guns and were not accorded any real measure of military value after their condemnation by Jervois in 1865. At Saint John, Quebec and Kingston the ready dismissal of the Martello towers was assisted by the apparent futility of attempting to defend any part of British North America by purely military means. At those places, the politically and financially unpalatable expedients necessary even to attempt such a defence resulted in the towers having neither any further value nor any successors. Under the aegis of the new dominion government, to whom all of these Martello towers were surrendered in 1870, the post-1846 British policy of defending the country largely with mobile forces reached its culmination in the "redoubtable" hands of Canada's political militia. While the British policy had put an end to the construction of towers the Canadian policy condemned them to disuse, neglect and decay.

The Carleton Martello tower was never effectively armed and Colonel Westmacott passed it over without reference in his 1863 summary of previous reports on New Brunswick defence. Defence of the city of Saint John and province of New Brunswick had attracted small attention in the reassessment of colonial defences that began to percolate through the British military hierarchy in the 1850s. In 1855 Saint John was reported to be virtually without defence, and the isolated and uncovered tower on Carleton Heights was reported to be practically useless even by the nebulous standards of that date.[54] In the very early 1860s there was a renewed concern as to the defensibility of Saint John. Between December 1861 and January 1863, four inclusive local defence reports were submitted to Great Britain and were considered by the British defence committee of 1862. The consensus appeared to be that the old communication route up the Saint John River valley was too vulnerable to be used in war and not worth defending. Saint John, however, was deemed an ideal offensive naval base for an enemy force moving against Halifax by way of Digby Gut and the Annapolis Basin, and measures were necessary to bar the enemy from it. Consequently in January 1863, Westmacott suggested that the proposed heavy sea batteries for Negro Point, Red Head, and Partridge Island be proceeded with immediately.[55] To defend the gorge to the Negro Point battery and assist in the land defence of Saint John, he also suggested establishing a redoubt in conjunction with the existing Carleton tower and arming the latter with a single 32-pounder traversing gun.[56] Westmacott, however, was not the final arbiter of the city's defensive dispositions and his views merely opened up the issue.

In September of 1863 Saint John was visited by Lieutenant Colonel W. F. D. Jervois, Deputy Director of Works at the War Office. Jervois shared Westmacott's fears of American occupation and suggested that the Carleton tower, with an iron shield on the roof to cover the guns, would make a keep to the Negro Point battery then in process of formation. This may have been a practical suggestion, and it was one echoed with regard to the Quebec towers. Jervois, however, was a military theorist assessing the practicality and cost of a viable British North American defensive system rather than a practical man seeking the least expensive solution to immediate problems. His purpose rather appeared to be to find the endeavour impracticable by reason of cost and to rationalize the military abandonment of the British American colonies. For Saint John his final report set out a cost estimate of £200,000 to include completion of the sea batteries, defences for the eastern approaches to the city and a chain of three redoubts across Carleton Heights on the lines of Nicolls's 1812 proposal. One of the latter forts was to be established in connection with the Carleton tower. A lack of detail makes it impossible to determine his intentions for the tower, or even whether it was to be armed, but an establishment on the suggested scale would certainly have rendered it largely redundant.[57] Given his appreciation of the impact of the new ordnance technology, he could hardly have visualized the old tower as more than a barrack or magazine covered by the scarp of a fort. His views were of little practical consequence, however. In the ebb-tide of Anglo-American hostilities, even the nearly completed Negro Point and Red Head sea batteries were not properly armed, and the unarmed and unimproved Carleton tower slipped unnoticed further down the scale of British military calculations of empire.

Jervois had earlier reported on the works of fortification in Canada, and, in November 1864, had estimated £1,754,000 as being necessary to make that colony defensible. These monies were to be expended chiefly at Quebec, Montreal and Kingston, whose permanent fortification would alone make Canada able to resist her powerful neighbour. In this manner Jervois posed a problem capable only of political solution at the highest level.[58]

At Quebec, Jervois predicated his assessment on the assumptions that it would not be attacked from the north side of the St. Lawrence until Montreal, which he proposed to fortify, had fallen, and that attention should first be concentrated on works to defend it from bombardment on the Lévis shore. Almost nothing had been done at Quebec, and little proposed, since the reinforced advanced tower line had been suggested in the early 1840s, although it had been frequently reported upon in the early 1860s. With the exception of the Citadel, Jervois ound the existing works hardly capable of defence.[59] He said of the Martello towers, "The guns of the owers are quite exposed, being mounted 'en barbette,' their fire would be silenced almost immediately, an enemy's batteries were opened against, unless they were covered by iron shields."[60] In conclusion, however, he made no such specific recommendation for them. He contented himself with proposing the general repair of the town works, the construction of a new line one and one-half miles in advance of it between the St. Lawrence and Saint-Charles to resist rifled guns, and the defence of Lévis by a chain of detached forts. Because until a very late date it was intended to exclude Quebec City from any general withdrawal from British North America, three of these Lévis works were constructed at a cost of £250,000 to the British treasury, although they were never armed.[61]

Although the only concrete effect of Jervois' report on Quebec was the construction of three expensive redoubts that were abandoned before they were armed, it did provoke a final short-lived controversy involving the towers. As an alternative to Jervois' advanced town line, Lieutenant Colonel Gallway, District Commanding Engineer at Quebec, suggested a bastioned line of ditch and parapet immediately in advance of the Martello towers that would convert each tower into an earth-banked keep for a casemated redoubt. He felt that the towers armed with two heavy guns, each in a cupola, could then make a powerful contribution to the defences. This scheme of moving the defences back within the suburbs of the town was a retrograde one, against the lessons to be drawn from the whole recent experience with rifled guns. Nonetheless, the precautions advocated by Gallway to make the towers useful at all clearly indicates their military obsolescence as functionally independent military works. In his scheme they would have become no more than bunkers. Their use was only suggested at all because their integration into a new line on the plains would have made it cheaper than an entirely new line.[62]

Further discussion of Gallway's proposal was quickly rendered academic. Both Jervois' 1864 and 1865 reports and his derivative scheme had been predicated on the belief that Canadians themselves would be prepared to bear part of the cost of their own defence. This assumption proved erroneous, and by 1868 it was observed that, while the British government had made great progress in improving the fortifications of Quebec, neither the Canadian assembly nor the new dominion government had contributed anything.[63]

At this juncture Canadian reluctance to participate in defensive preparations, and a welter of other economic, military and political influences operating upon it, were leading the British government inexorably to a general military withdrawal from British North America as a whole. This event was precipitated in December 1868 by the assumption of office of a new Liberal government headed by W. E. Gladstone. He was a long-time opponent of colonial military expenditures and moved quickly to implement his views.

It had always been assumed that Halifax would be retained as a garrisoned and fortified imperial station and Quebec retained as an avenue by which Canada could be supported in a crisis. In 1869, however, after an involved debate, it was decided that Quebec too would be abandoned and only the easily defensible and directly useful Halifax retained. This decision was communicated to Canada on 12 February 1870. The Quebec Citadel was finally vacated on 11 November 1871.[64] The final British withdrawal left the four Quebec Martello towers in no more defensible state than they had been on their completion in 1812.

The resolution of the great issues of imperial politics, and the lesser military considerations that caused the British reluctantly to abandon the Quebec fortifications, operated more quickly and definitely in regard to those at Kingston. It had been the recognized terminus of British inland power since 1825 and its works, unimproved since 1848, were obsolete and unequivocally slated for abandonment in 1869 by a power unsure even of its capacity to hold the Quebec Citadel.

Jervois condemned the existing works at Kingston, and particularly the Martello towers, in his 1865 report, but in this instance he was merely echoing frequent local complaints. As early as 1861 Fort Henry was reported defective before rifled ordnance, since it mounted ordnance that had not been improved since its completion nearly 30 years before. The whole of Kingston was so open to attack by rifled guns from the water and from Wolfe and Garden islands that it was no longer a reliable repository for military or naval stores. The mounting of the tower ordnance at the end of 1862 helped but little, as the inspectional report of that year stated that the pintles on Fort Henry and all the batteries were defective and broke under the slightest provocation. No improvements were made, and Kingston clearly remained effectively undefended except for the towers which, despite some of them being enclosed in redoubts, were not proof against rifled guns.[65]

Jervois' first survey of the defences of Kingston and the rest of Upper Canada in 1863 was so unfavourable that in the existing circumstances he could suggest no plan for its defence. In 1864, however, in response to local political pressures and the declared intention of the government of Canada to provide a fortified harbour and naval establishment at Kingston with a view to placing a naval force on Lake Ontario, he undertook a more detailed and optimistic examination of it.[66]

Jervois opened his critical assessment of the existing works with the remark that, "Nearly all the guns are mounted 'en barbette,' and thus liable to be easily silenced by rifled ordnance."[67] He continued by stating that

> *Even in the days when rifled ordnance was unknown, these works of themselves could never have afforded efficient protection to a naval establishment at Kingston either from a sea or land attack. An enemy with a temporary naval superiority at this point might land troops either to eastward or westward of Kingston, and proceed to one of the several positions from which he could destroy a naval establishment constructed under cover of the existing defences, or burn the town if he pleased. He might also fire into the dockyard and town from the lake.*[68]

Jervois deemed all the existing works so defective in both quality and location that he completely dismissed them in his proposed new defences for the Canadian naval establishment.

This scheme involved a complete circle of heavy permanent works distant one and one-half to three miles from the landward side of the harbour, and equally distant from the islands in advance of it, as the only effective protection from the accurate fire of rifled guns. The estimated cost of these works was £391,000.[69] His report placed the onus on the Canadians to demonstrate their willingness to pay a high price for the defence of Upper Canada. When they failed to respond by 1869, the disbandment of the units of the Royal Canadian Rifles stationed there and the surrender of the existing works was an automatic consequence of the general British military decision to leave the Canadian interior and the Canadians to their own devices. The decision made little difference to a town and naval dockyard whose four batteries and six Martello towers had never provided it with a secure permanent defence.

An examination of the effective military demise of the 16 Canadian Martello towers in the decade of the 1860s is in part a commentary on the eventual fate of all permanent works of fortification and defence. In the end they were simply overwhelmed, not by the hostile assault for which they had been prepared for decades, but by the sheer mass of an accelerating military technology.

The rifled gun and the conditions and expenses of warfare it prescribed rendered these light permanent works abruptly obsolete in the fulfillment of their established defensive roles. The event terminated a lengthy process of gradual decline. A combination of British unwillingness to continue defending Canada and a Canadian reluctance to fulfill that responsibility adequately on its own denied some of the towers an opportunity to fill even a subsidiary role in a new defensive system. Only at Halifax, and there under peculiar local circumstances, did any of them continue in active service. For the most part, however, continued use would have been impossible anyway, for the influences of the rifled gun were not limited by its power to penetrate the fully or partially exposed masonry walls on the Martello towers. Its effective range of several thousand yards forced any potentially effective defences out a corresponding distance from the objects they were designed to protect, and, in all but exceptional circumstances, reduced the Martello towers, situated in the immediate vicinity of their objects in the era of smoothbore guns, to the level of local military curiosities.

Paradoxically it was in this period of reviving military interest, between 1846 and 1871, that the existing Martello towers experienced the greatest period of their paramilitary uses, as barracks and magazines. These uses, however, were merely an expedient employment of structures already present, and in no way justified their preservation or continuation in service outside of Halifax, once the British departure reduced pressure on the existing military facilities.

Between the commencement of the Kingston towers in 1846 and the British surrender of 11 of the 16 Martello towers and subordination of the remainder in the years before 1871, this type of work, and the existing towers in particular, underwent a process of progressive obsolescence. It was so gradual as to be almost indiscernible in the face of the quantitative additions to the American smoothbore arsenal, better communications and steam navigation in the 1840s and 1850s. The military impact of an improving technology and developing frontier was exacerbated, in British North America, by the military's reluctance to acknowledge the obsolescence of existing fortifications in a climate of opinion that virtually precluded their improvement or replacement. The rifled gun produced qualitative changes in ordnance technology that had real, immediate and far-reaching influences on the future of Martello towers. It was, at the same time, of an order of magnitude to force even the most recalcitrant and equivocal military tacticians to an admission of the obsolescence of masonry towers. This whole terminal era in the active history of the towers can be viewed as a leisurely and inevitable running out of the clock, marked by the single all-encompassing discontinuity of the introduction of the rifled muzzle-loading gun.

Conclusions

Martello towers were a distinctive and characteristic form of light permanent fortification popular in British North America in the half-century between 1796 and 1846. Militarily, they bridged the gap between the ephemeral and scattered colonial defence works of the 18th century and the massive, strategically sited and permanent casemated masonry forts of the 19th century. Politically, the inception of the towers in British North America was closely bound up with the imperial government's desire to regularize the defence of the British American colonies, and their decline coincided with the abandonment of the policy of defending the interior of those colonies against possible American aggression.

Martello towers were of declining value in the altered conditions of British North American warfare after 1846, but they remained in full and active service until rendered obsolete by the adoption of rifled ordnance after 1860. Although this important technical development marked the real end of their direct military use in an effective offensive capacity, all of the towers were retained in service until the British withdrawal in 1870. After that time only three or four of the five in Halifax remained in use, in much diminished roles. Had the British remained, the rifled gun and the need for a much heavier and expanded system of works to combat it would have led to similar treatment of the other towers. Martello towers were very much a product of the late smoothbore era of ordnance development, and, though in eclipse after 1860, they provided 75 years of armed service to the British defenders of British North America.

The Canadian Martello towers were all self-defensible elevated gun platforms erected as battery keeps, light sea batteries or detached land defences. A great variety of structural variation was displayed in the achievement of this essential functional similarity. These variations were products of the personal predilections of their builders and the maturation of the design over time. The Canadian towers can be classified into three separate structural phases: Edward's first three Halifax towers; the seven commenced between 1808 and 1815 at Quebec, Saint John, and Halifax; and the six constructed at Kingston after 1845. Edward's towers were the simplest and least defensible of all those constructed in Canada, while those at Kingston were the most complex and best adapted to resist bombardment by heavy smoothbore guns. The offensive and defensive ordnance of the towers themselves was a free adaptation of the pieces best suited to the requirements and role of each tower. They were generally a mixture of guns and carronades of varying calibres. Such an amalgam combined accurate long-range fire with a high volume of short-range protection. The towers' mixed firepower, resistence to artillery and high escarp walls made them effective and versatile defensive instruments in selected circumstances.

Structurally, the towers displayed certain basic similarities. In addition to their common preparation for a mixed top ordnance of guns and carronades, each was embrasured for several additional pieces lower down the scarp wall, and each was provided with some means of loopholed musketry flank defence. Most of the towers were two storeys in height but in a few cases a third storey was added to provide more barrack accommodation. In every necessary case the lower storey was fitted out as a storage area with a magazine, and the upper storey or storeys were always reserved for barrack use. The towers varied in exterior diameter from 30 to 72 ft. and in height from 26 to 46 ft. The Prince of Wales Tower was at once the lowest and widest of them.

The solid exterior walls of the towers varied greatly in thickness, from 4 ft. at York Redoubt to 15 ft. on the seaward face of the Kingston towers. The Canadian towers were formed from a variety of locally available building materials. In every case they were faced in masonry, either rubble or ashlar. In a few instances their walls were of uniform composition but generally the interior of the towers was lined with brick and the wall filled with rubble masonry to the exterior cutstone facing.

All but two of the towers were constructed with a circular central brick or masonry pillar to support their wooden terreplein roofs or bombproof arches. These pillars were generally solid columns, but in some of those in the Maritime provinces they were hollow. For the most part the central spaces thus created were small. At the Prince of Wales tower, however, this arrangement was used to create an inner room 16 ft. in diameter.

Most of the Canadian Martello towers were provided with a bombproof brick or ashlar masonry arch during their construction and only two of the Halifax towers remained without that form of defence against high-angled fire. In most cases these were annular arches sprung from the central pillar, although the Branch Ditch towers at Fort Henry were provided with domed arches. Most of the towers contained their own bombproof, brick-lined expense magazine on the lower level, and most were provided with some form of local water supply.

All of the towers, with the exception of some of those at Halifax, were constructed with their main entrances at the second level of the towers. These were reached by means of drawbridges or movable stairs. At Halifax a confusing variety of means of access was provided for the first four towers constructed. The parapet height of most of the towers was 6 ft. as this provided full cover for the defenders and was the level best adapted for the use of traversing guns. A banquette at the base of the parapet was a necessary feature of each. Varying means of musketry flank defence were provided for the towers. They included caponiers, machicoulis, and ranges of loopholes in the tower walls themselves.

It is evident that there was no single structural pattern in the development of Canadian Martello towers. Each tower, or small group of towers, in a particular locale was freely adapted and conditioned to the various requirements of its particular military environment. These necessary adaptations were magnified by the whims of their various builders, the press of circumstances and the changing military conditions over the 50-year span of their construction.

This generation of masonry towers originated at the end of the 18th century. Such works had long been a popular form of coastal defence in southern Europe, but their widespread adoption into the British military service at that time was the joint product of an accident of military history and the desperate straits of the British government in the face of a threatened Napoleonic invasion. The impressive resistance of the masonry tower on Cape Mortella in Corsica in 1794 popularized the value of such works. The conditioning of this incident made masonry gun towers an obvious expedient when a decade later, the British government was casting about for a cheap, durable, impressive and easily built means of defending the threatened coastline of the British Isles. There and later in Canada, strictly military considerations were not paramount, and little cognizance was taken of the inherent defects and weaknesses of all such works. The government dwelt instead on their capacity to resist naval gunfire, the difficulty of scaling their high scarp walls and the low level of maintenance and small garrisons that they required. Martello towers were, everywhere and always, a compromise that met the capacities of the British government, even if they did not completely fill the requirements for permanent fixed artillery defences.

The hundred or so Martello towers constructed in Great Britain between 1804 and 1812 were adopted for the single purpose of sea defence. In this capacity their vulnerability to an accurate land-based artillery fire was not a consideration. In British North America their use was not so restricted. Here they were freely adapted to meet a wide variety of local needs. This wider use constitutes the most important single difference between the British and the British American Martello towers. This difference was partly a consequence of the differing defensive requirements of the two areas, but it was chiefly a question of money. Large sums were rarely lavished on colonial defence, and at the end of the 18th century towers generally offered the only means of permanently and cheaply fortifying important colonial centres. Their great durability and low maintenance levels were a great attraction in a climate where hard frosts could destroy equally expensive earthworks in a year. Their thick masonry walls were also infinitely more able to resist artillery fire than the wooden blockhouses that remained their only practical enduring alternative. With these inducements it is not surprising that engineers and other military officers in British North America chose to ignore the disadvantages of the towers in certain circumstances and to employ them in preference to less durable structures or no works at all.

A total of ten Martello towers were completed or commenced in British North America in the first enthusiasm of their acceptance, in the years between 1796 and 1815. The first few were built to combat the menace of French naval attack but all of the later ones were constructed to resist an emergent American enemy. The first three towers, erected at Halifax between 1796 and 1798, owed nothing to the design later accepted in England. They differed from those towers in function and in many significant structural features. They owed their origin to the same pre-1800 causal factors that later produced the English towers. These included the Cape Mortella incident and the pre-1794 British military view of the value of such works in special conditions, primarily as keeps for batteries. All of the other Canadian towers post-dated the commencement of the contemporary English works. In consequence, although they displayed considerable structural dissimilarities in detail, they were basically derived from the English designs, and incorporated all of their more salient features. The first four such towers were constructed at Quebec City between 1810 and 1812. Before 1815, two more were finished and one commenced in the Maritime provinces.

Their unrestricted adaptive use was clearly illustrated in the varied locations of these first towers. The three early Halifax towers were battery keeps, assailable principally from the land. The four Quebec towers and the one built at Saint John, New Brunswick, were employed entirely in land defence roles. Only the ones for Georges Island and Mauger Beach at Halifax fully met the accepted British requisite of being primarily exposed to less effective naval gunfire. The full acceptability of Martello towers in land-bound colonial locales is reinforced by the proposal of a number of others in similar circumstances in this period. These were fully accepted by the local military commanders and by the Board of Ordnance in England. In every instance they appear to have failed of implementation from some combination of labour, time or money rather than from voices raised against their effectiveness. Although eight of the Canadian towers were armed and prepared for combat at the outset of the War of 1812, none of them was subjected to attack.

The military readiness of the Martello towers declined and they were subjected to decades of neglect in the era of peace that followed the War of 1812. No new Martello towers were begun between 1815 and 1845. They continued, however, to be a popular proposed means of meeting a wide variety of local defensive needs. While the towers continued to be an accepted facet of the fortification orthodoxy of the postwar decades, their overall value declined somewhat as a changing imperial policy brought the construction of large permanent masonry works within the grasp of the military in the colonies. This emergent policy, fully articulated by the Smyth Commission of 1825 and accepted and implemented by the engineer committees of 1826-29, produced a concentration of all available financial resources on a few major fortresses collectively designed to resist an American attack until the country could be relieved from abroad. These works were of a new order of magnitude in British America and they severely eclipsed the mere delaying role of even the most advantageously sited of the Martello towers.

While this new strategic departure effectively prevented the completion of any more Martello towers, it did not hamper their continued proposal at all. Each of the new heavy works was inevitably very costly, and in consequence there could be very few of them. Martello towers remained a satisfactory means of filling some of the gaps in a naval and military frontier that extended for over 1,000 miles into the continental interior. The all-important Smyth Commission of 1825 itself recommended their frequent use, and its commendation was repeatedly echoed over the next 20 years by military authorities in England and in British North America.

The last Canadian Martello towers, however, were not constructed as minor adjuncts to the main defensive policy laid down in 1825, but were instead a direct consequence of its recognized failure. As early as 1841 it was realized in some quarters that available financial resources would never allow a number of fortresses adequate to prevent a successful American invasion of the interior of British North America. Rapidly improving land communications and the almost absolute American naval supremacy on the Great Lakes would inevitably open up more avenues of assault for a well-supplied American army than heavy fixed fortifications could ever close. These military factors dictated a further reassessment of the prospects and requisites of British American defence.

This leisurely re-examination was abruptly terminated by a new Anglo-American crisis in 1845. A hurried review of the existing defences in that year prompted the British Colonial Office precipitately to order the commencement of the Martello towers at Kingston. These long mooted works were of no overwhelming military value, but they did meet important political requirements and offer some cursory measure of military defence to the terminus of British interior communications.

After 1846, with the dissipation of the Oregon crisis, the British government was able to resume its interrupted examination of its role in the defence of British North America. In the preceding crisis it had become evident that any successful defence in the interior must rest mainly on the spirit of the local populace. The conclusion that neither fortifications nor British regulars would be of much avail was welcomed in the altered British political atmosphere that prevailed after 1846. This far-reaching decision began to be implemented with the reduction and concentration of the garrisons in the early 1850s. It proceeded, with only one significant interruption, until the final withdrawal of the British army from the North American interior.

This new British political departure guaranteed that no new Martello towers would be built. The Kingston towers were only completed in 1848 because of the previous investment in their construction. They were among the last works to be completed in the interior of British North America. Even without this change in policy, it is doubtful if more would have been erected, as they were clearly approaching obsolescence. The Kingston towers were provided with all possible ancillary defences, but they were never deemed fully defensible against steam war vessels, heavier smoothbore guns and the increased power of the more numerous American armies. These same criticisms applied in even greater measure to the older towers, none of which had been improved since 1815.

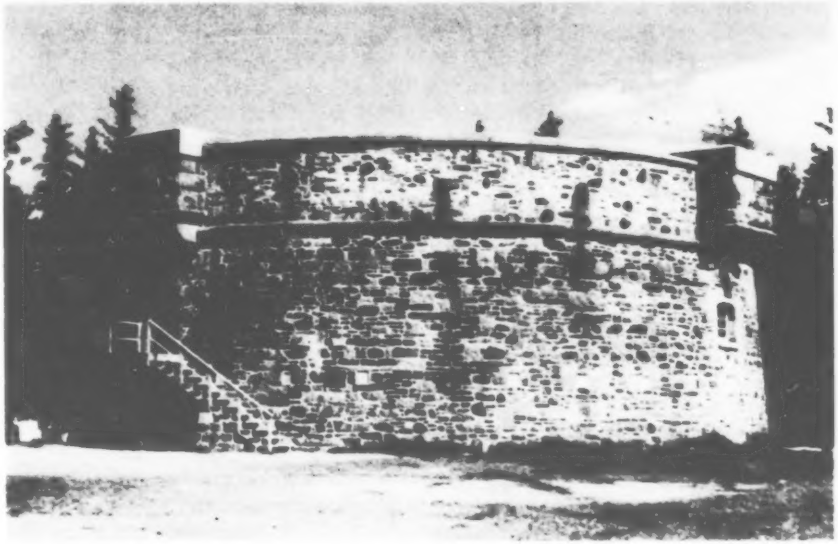
The declining value of the 16 Canadian Martello towers was little noted in the peaceful decade of the 1850s. Their defensibility was not improved, and they were not armed or rearmed to meet changing military requirements. Subsidiary military uses were found for some of them, however, and all were maintained as active, unchallenged components of the existing permanent defence system.

This quiet perpetuation of the towers in their original roles was suddenly terminated by the introduction of the powerful and revolutionary rifled gun into the American military service in 1860. This new weapon, with its longer range, greater accuracy and more potent breaching power at once rendered most of the old works of defence, including Martello towers, recognizably obsolete. A display of the power of these new guns in the opening phases of the American Civil War, and the coincident Anglo-American military crisis of 1861-62 with its uneasy aftermath, forced yet another hurried review of British American defences. These examinations, carried out between 1862 and 1865, produced implicit or explicit condemnations of Martello towers in every instance. The successive reports merely voiced a fact that had been inescapable since 1860 and was in process of being recognized even before that. Most of the towers remained armed and some of them continued in their previous uses until 1870, but after 1860 their only possible value was as supporting adjuncts to the new works designed to house and resist the new rifled guns. The simultaneous British military withdrawal prevented the continuation of their services everywhere except at Halifax, where the British remained until 1906. There the Prince of Wales Tower was retained as a magazine, and two of the other towers were incorporated into more modern works. Neither they nor any of the others, however, were of any armed military value after 1870.

Martello towers were erected to meet the nearly static requirements of British North American defence between 1796 and 1846. Their military value declined thereafter and they were made fully obsolete by the rifled gun in 1860. For the most part they ceased to be of any military importance in 1870, when the divergent strands of their technical obsolescence and the imperial policy of withdrawal finally combined to thrust nearly all of them into the hands of an uninterested Canadian nation.

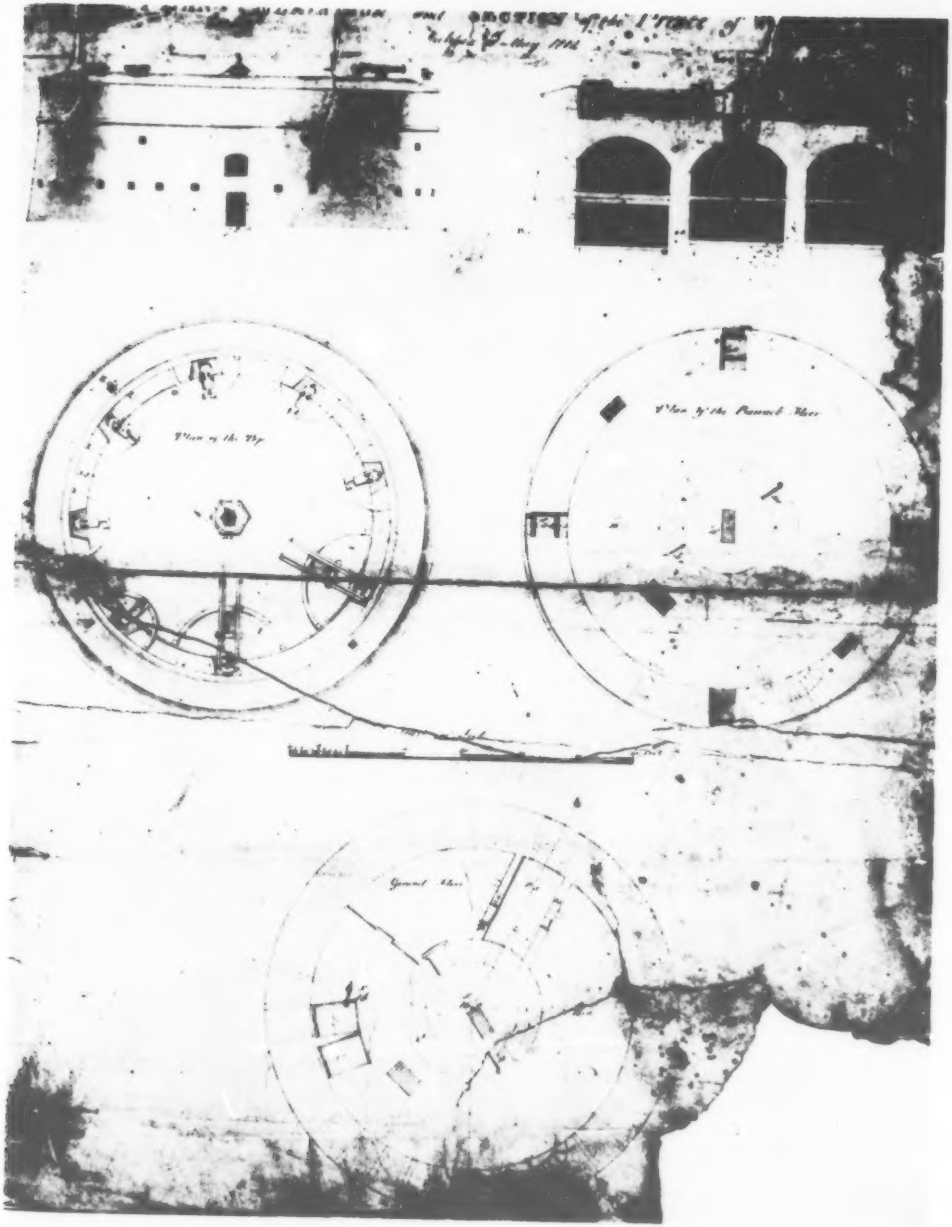
Appendix A. Prince of Wales Tower, Halifax

Built: 1796-8
Armed: by 1802
Disarmed: after 1875
Demolished: (extant, 1972)
Facing material: ironstone rubble masonry
Diameter: 72 ft.
Height: 26 ft.
Wall thickness: 8 ft.
Parapet height: 6 ft.
Storeys: two
Purpose: to defend the rear of the Point Pleasant batteries and to prevent a landing from the Northwest Arm. After 1864, the tower was used as a self-defensible depot magazine.

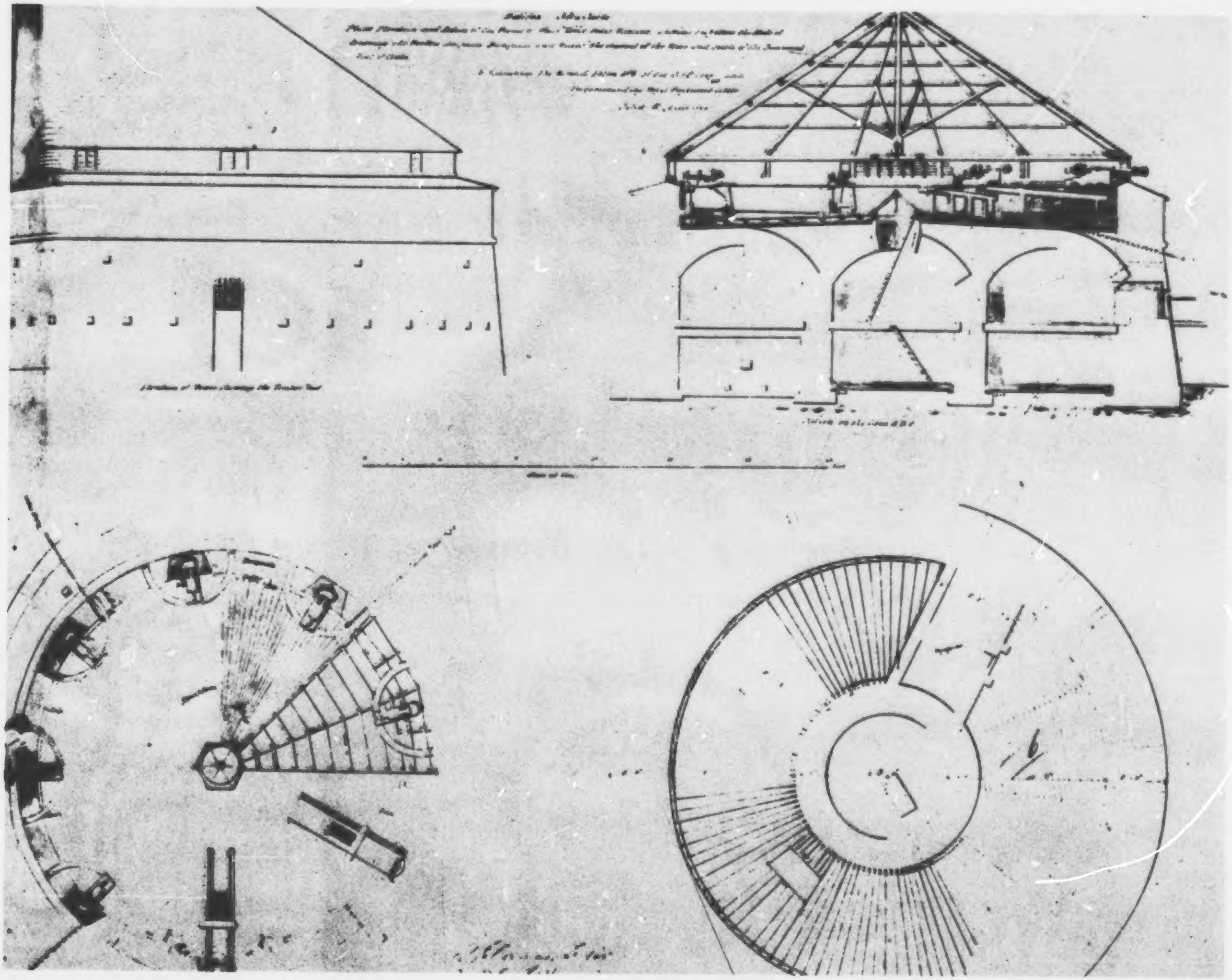


12 Prince of Wales Tower, 1971, showing entrance doors and machicolation galleries.
(Photograph by author.)

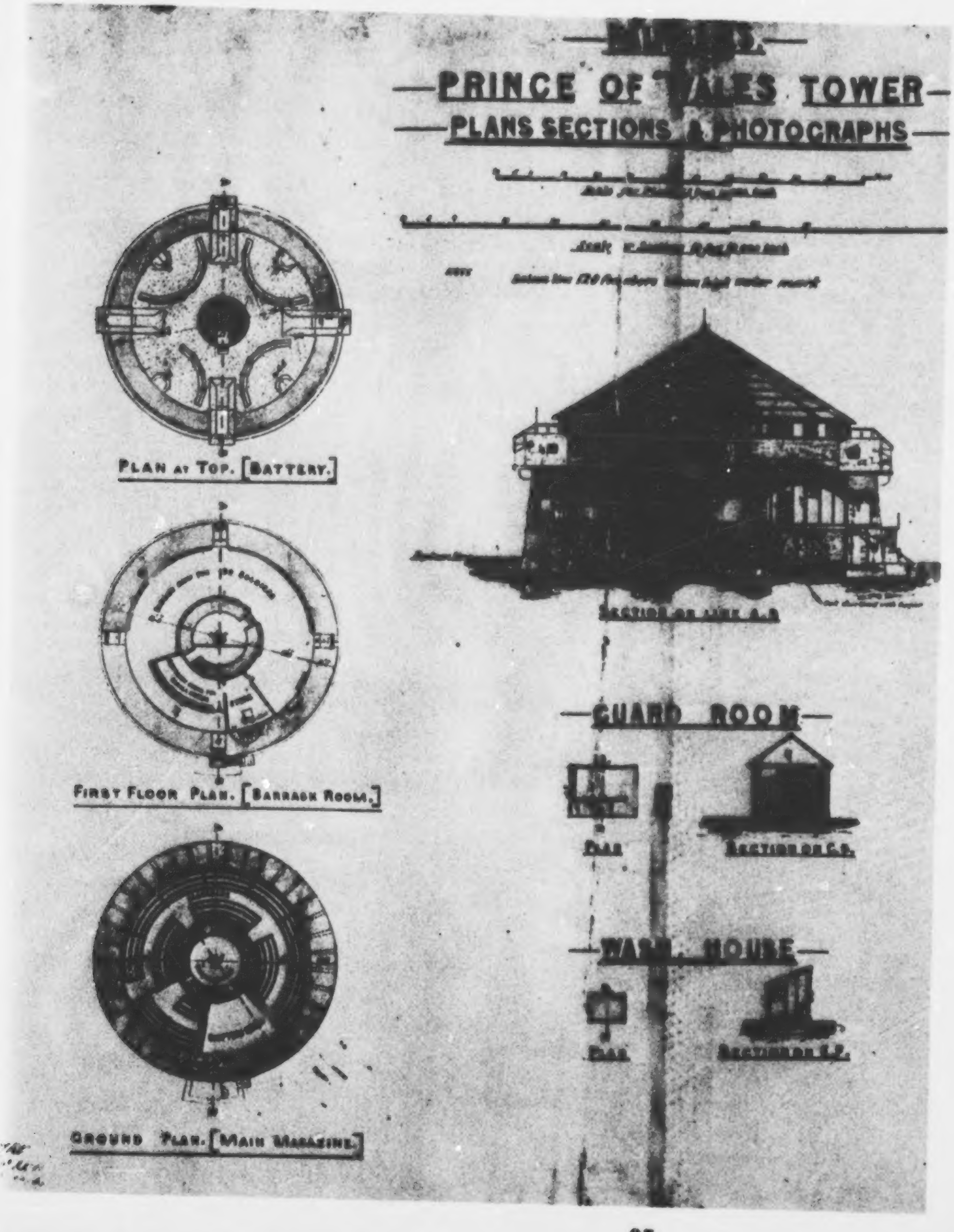
Prince of Wales Tower, view, section and floor plans, 1812, showing changes in structure and armament made by 1812.
(Public Archives of Canada.)



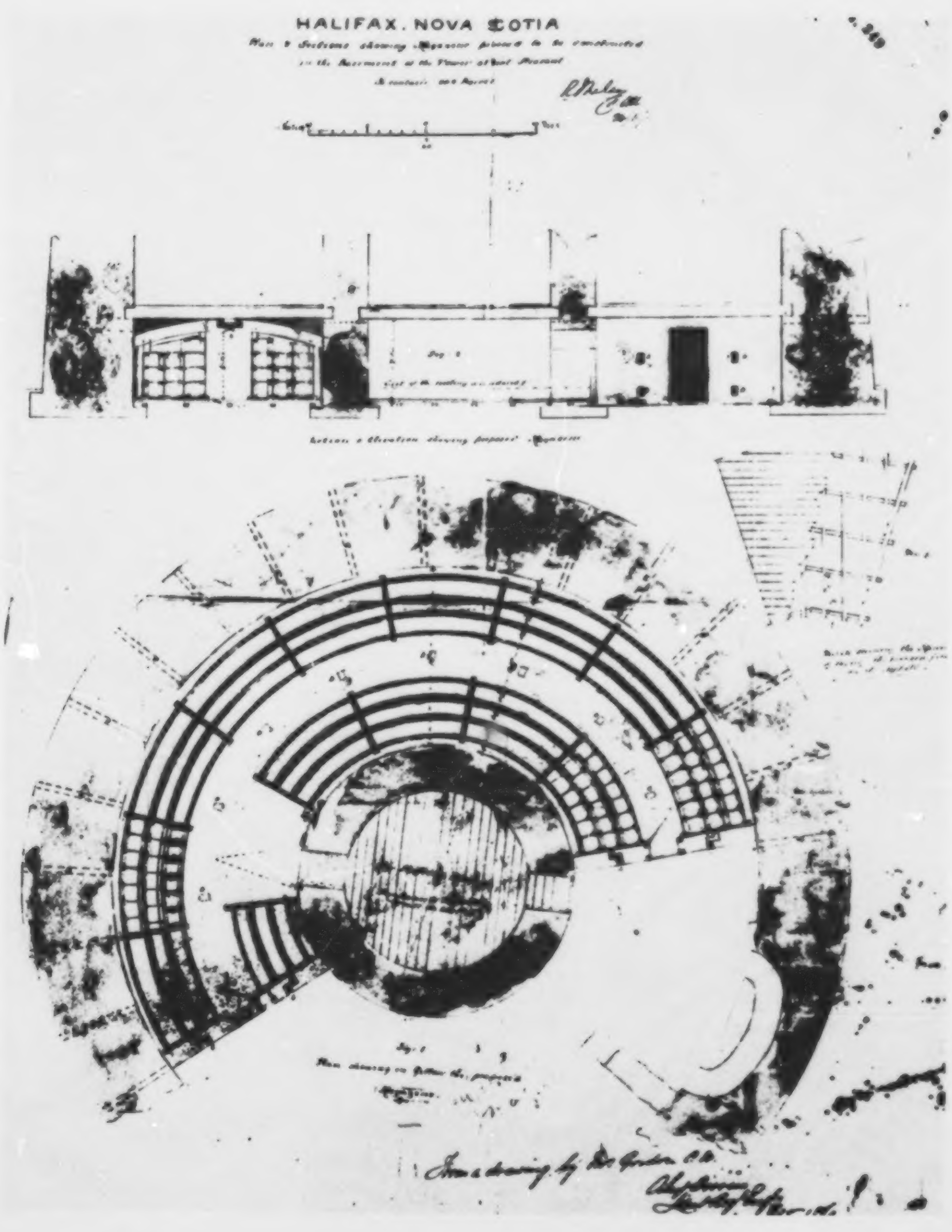
14 Prince of Wales Tower, view, section, barrack and platform floor plans, 1849, showing plan for proposed new roof.



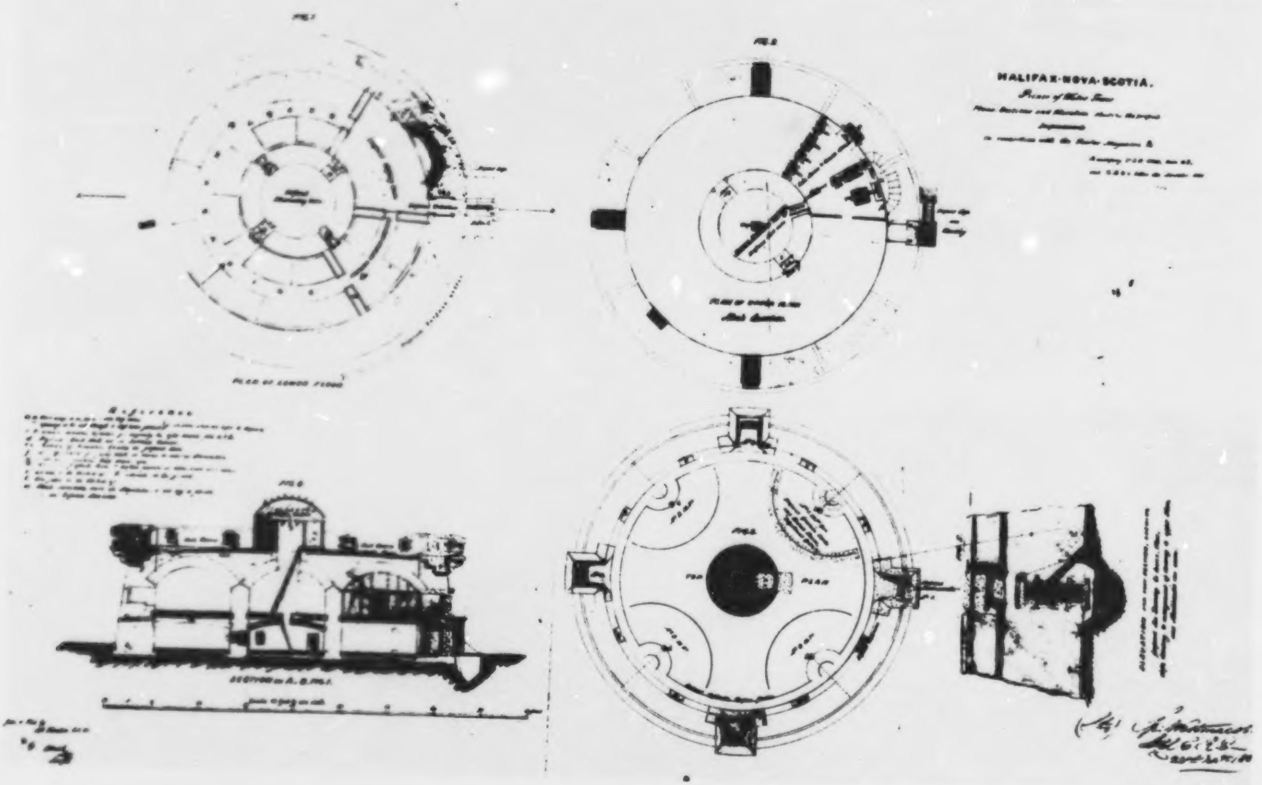
15 Prince of Wales Tower, section and floor plans, 1880, showing alterations made in the 1860s. *(Public Archives of Canada.)*



16 Prince of Wales Tower, 1860, basement floor plan and section showing proposed partial magazine conversion.
(Public Archives of Canada.)



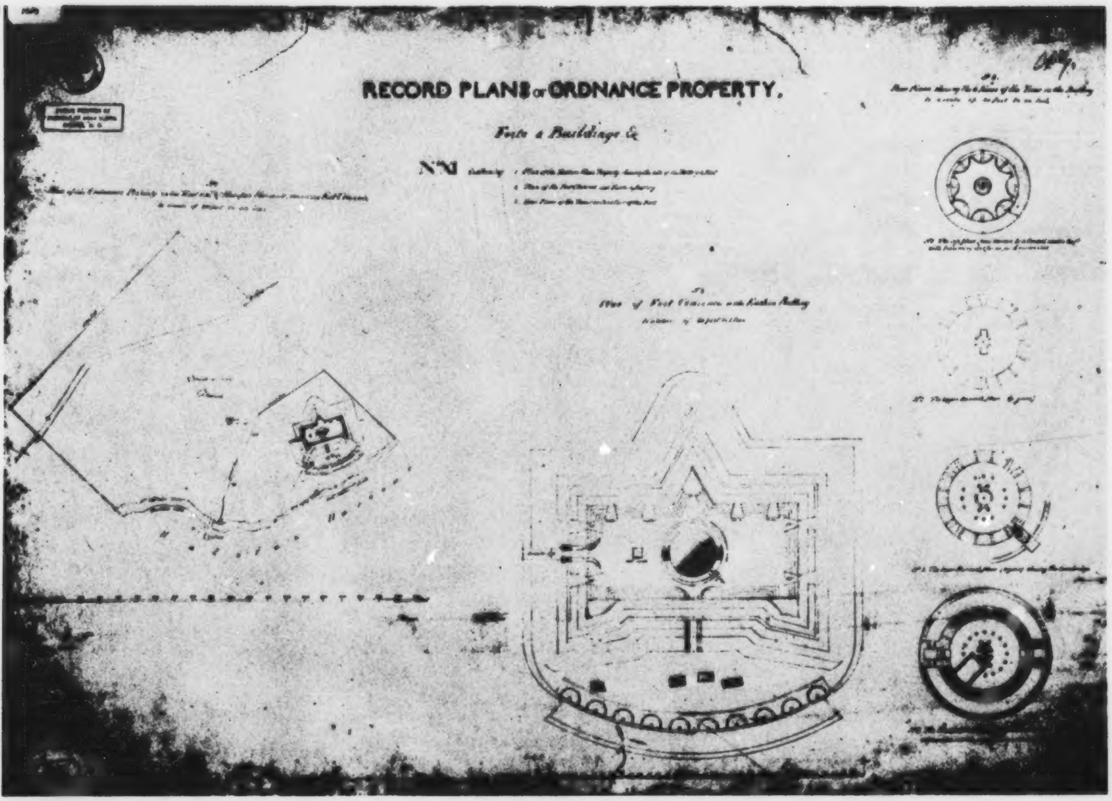
17 Prince of Wales Tower, 1861, floor plans and section showing proposed complete conversion of basement to magazine.
(Public Archives of Canada.)



Appendix B. Duke of Clarence's Tower (Fort Clarence Tower), Halifax

Built: 1798
Armed: before 1808
Disarmed: ca. 1864
Demolished: top storey, ca. 1865; middle storey, 1889; basement level extant in 1945.
Facing material: sandstone rubble masonry
Diameter: 50 ft.
Height: 42 ft.
Wall thickness: 6 ft.
Parapet height: originally 6 ft. Partially cut to 3 ft. in 1812.
Storeys: three
Purpose: in 1798, it was intended to be a keep and barrack for the Fort Clarence sea battery and redoubt. In 1870, it was a barrack and magazine for the rifled muzzle-loading battery. In 1889, it was a magazine.

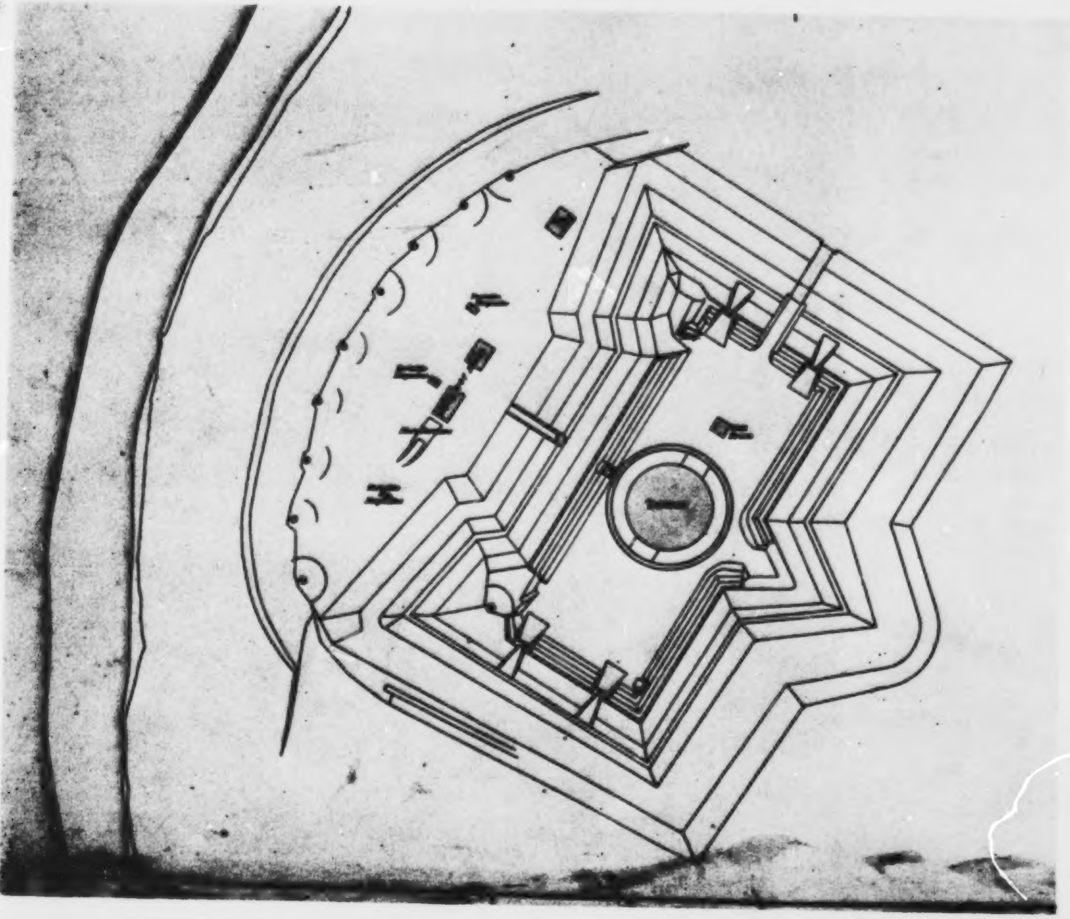
18

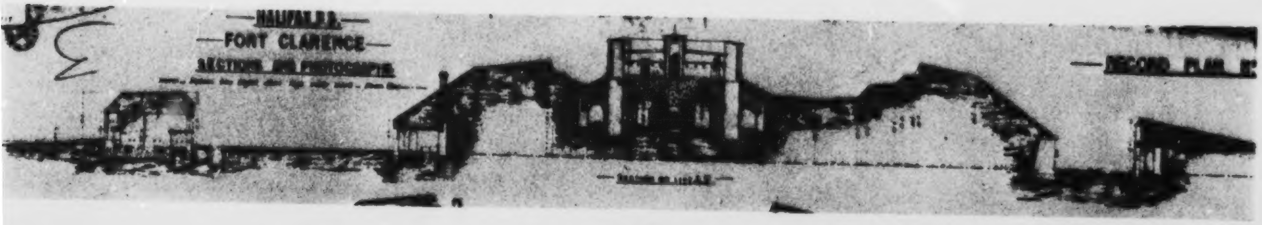


18 Fort Clarence, plan, 1853.
(Public Archives of Canada.)

9 Plan of Fort Clarence, 1853.
(Public Archives of Canada.)

20 Fort Clarence, 1879. Section of the revised fort and tower.
(Public Archives of Nova Scotia.)



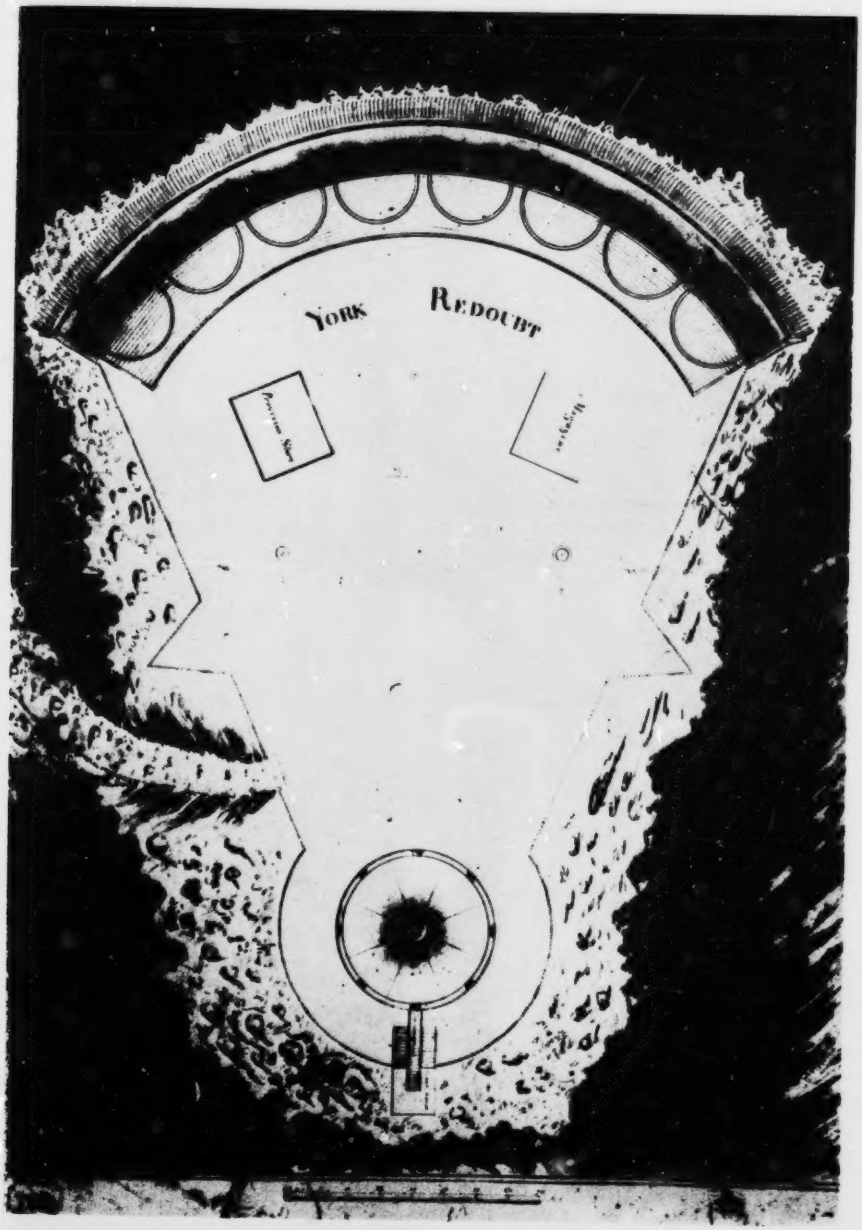


21 The remaining portion of the York Redoubt tower, 1971.
(Photograph by author.)

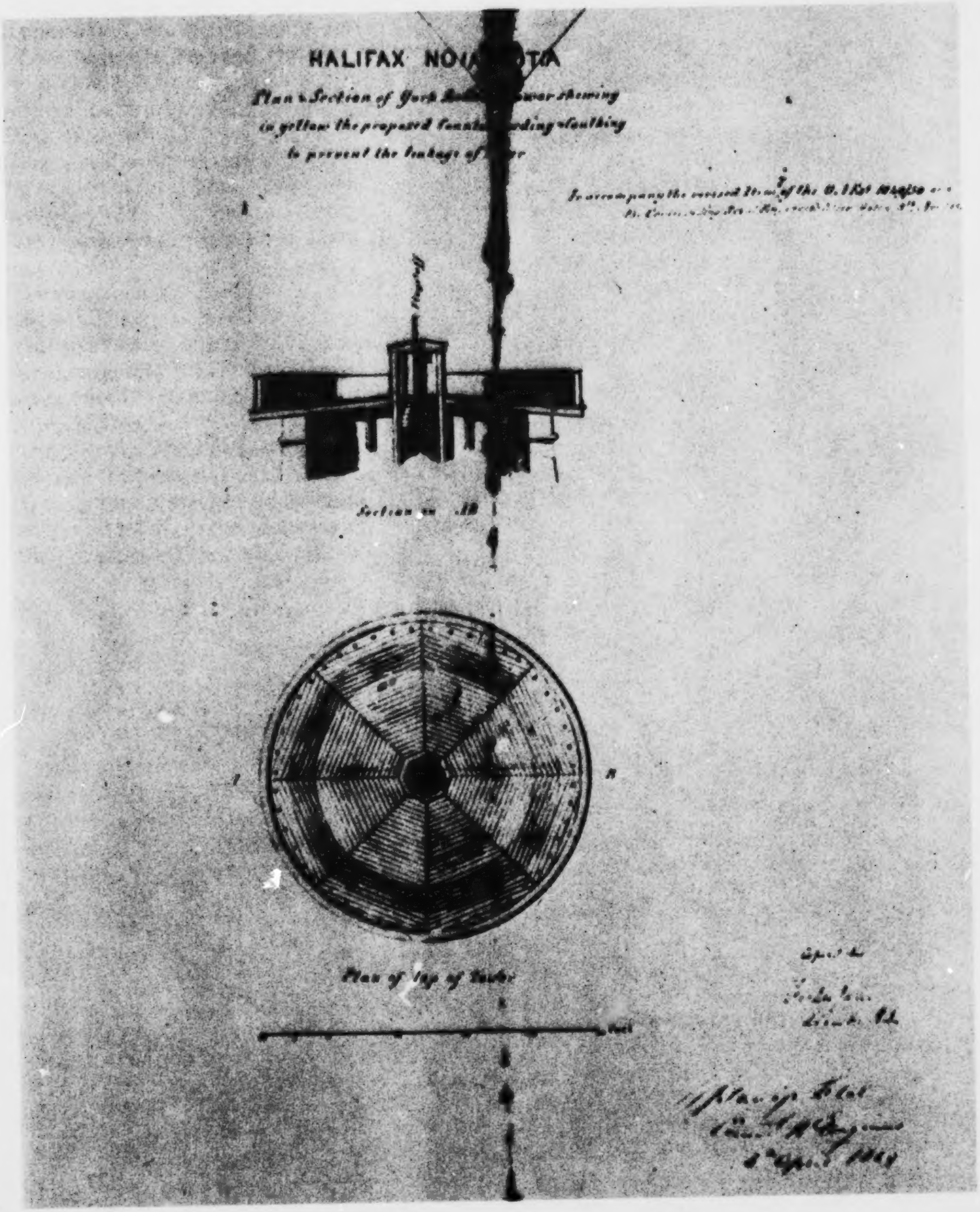
Appendix C. Duke of York's Tower, (York Redoubt Tower), Halifax

Built: 1798
Armed: before 1808
Disarmed: 1865-75
Demolished: top storey destroyed by fire, ca. 1890. Basement level extant, 1972.
Facing material: rubble ironstone masonry
Diameter: 40 ft.
Height: 30 ft.
Wall thickness: 4 ft.
Parapet height: 4 ft. high in wood until after 1870.
Storeys: two
Purpose: in 1798, a keep and land defence for York Redoubt. After 1875, a caponiered flank defence for the line wall in the rear of the rifled muzzle-loader redoubt.

22 Plan of York Redoubt and tower, n.d.
(*Public Archives of Canada.*)



23 York Redoubt tower, platform and section of upper tower, 1849.

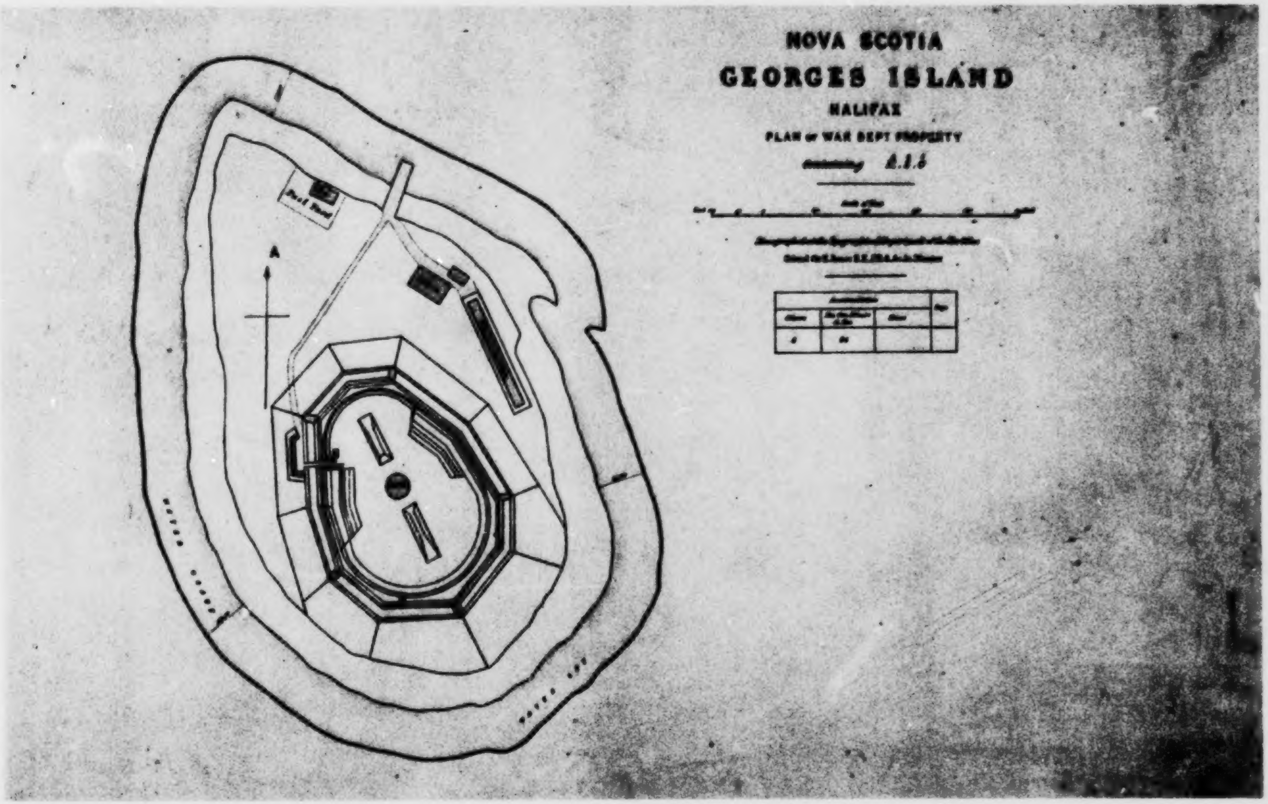

HALIFAX NOVA SCOTIA
Plan & Section of York Red... Tower shewing
in yellow the proposed Counter...rding & Caulking
to prevent the leakage of ...er
Section on AB
A
B
Plan of top of Tower
Feet
2nd April 1849

2-1 Georges Island, plan of the island, fort and tower, 1869.
(Public Archives of Canada.)

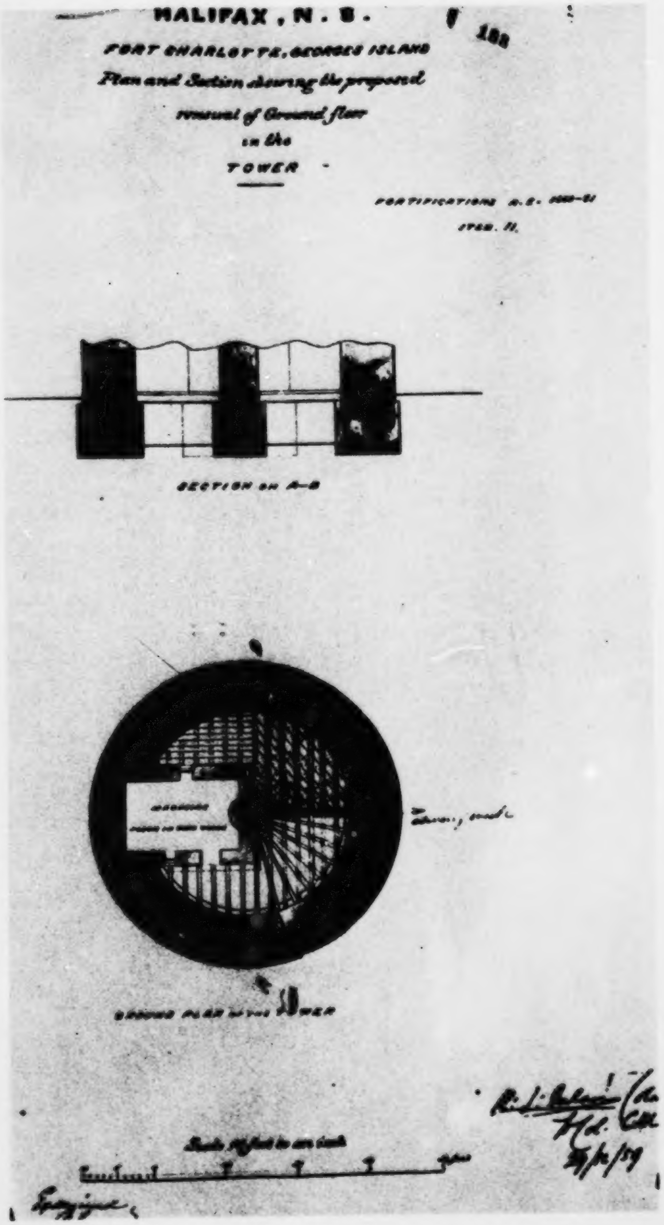
Appendix D. Georges Island Tower, Halifax

Built: 1812
Armed: 1812
Disarmed: 1865-77
Demolished: ca. 1877
Facing material: stone (nature unknown)
Diameter: 43 ft.
Height: unknown
Wall thickness: 7 ft.
Parapet height: unknown
Storeys: two

Purpose: to serve as a keep to the Georges Island batteries; to sweep the batteries and the periphery of the island in the event of an assault landing.



25 Georges Island tower, plan and section of basement, 1859.
(Public Archives of Canada.)



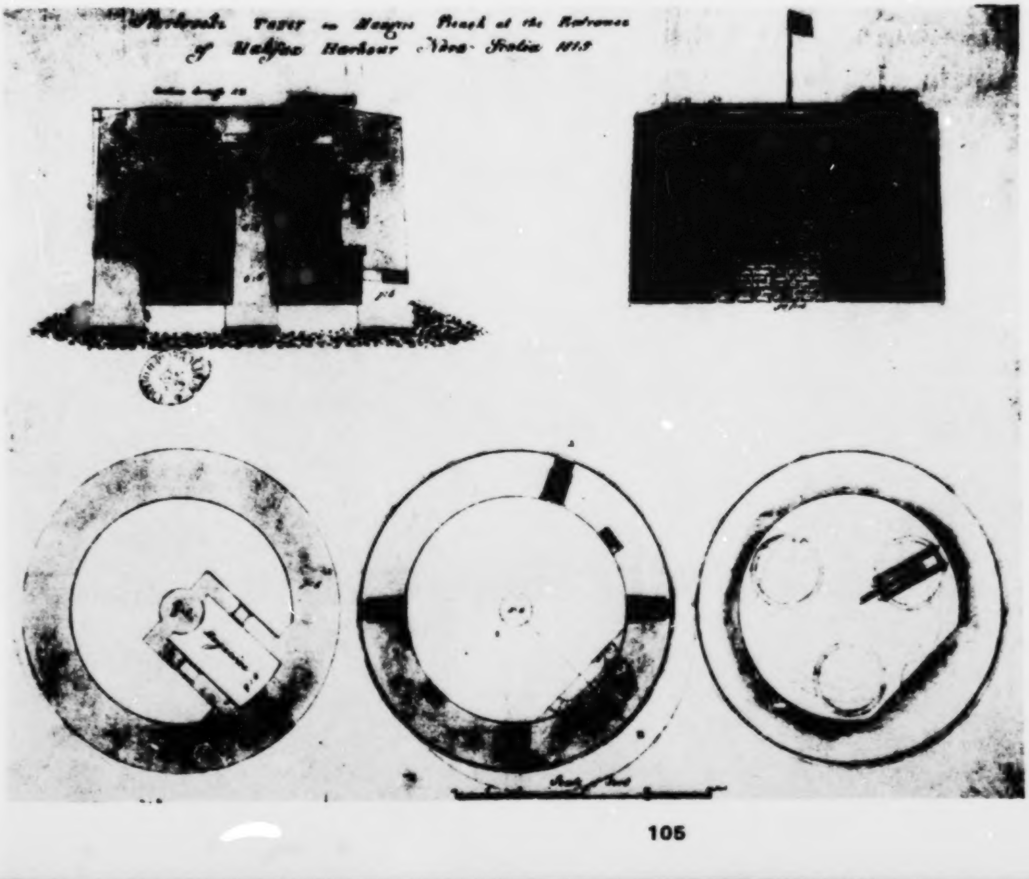
HALIFAX, N. S.
FORT CHARLOTTE, GEORGES ISLAND
Plan and Section shewing the proposed removal of Ground floor in the TOWER
FORTIFICATIONS
SECTION ON A–B
GROUND PLAN OF THE TOWER

26 Sherbrooke Tower as proposed; floor plans, view and section.
(Public Archives of Nova Scotia.)

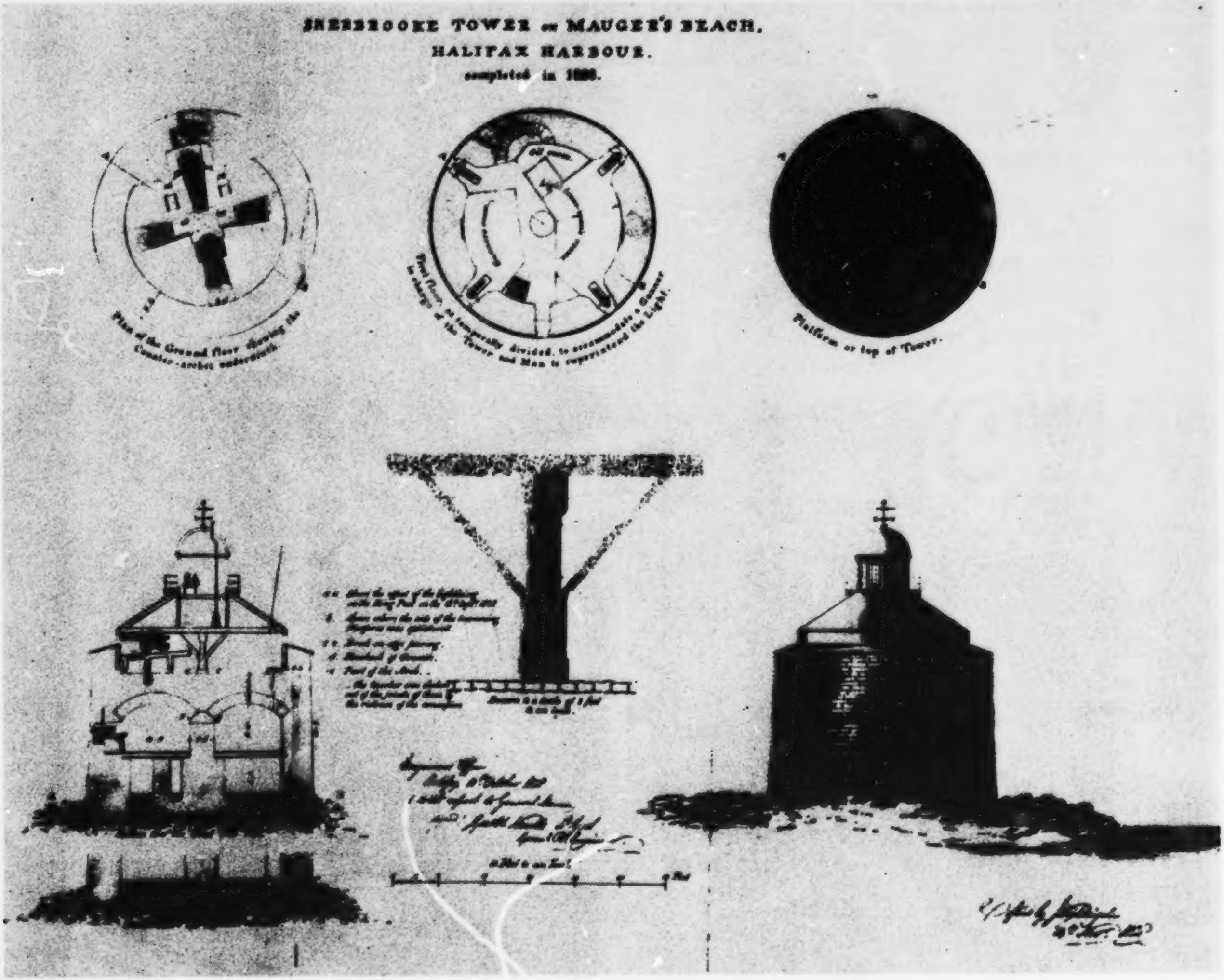
Appendix E. Sherbrooke Tower, Halifax

Built: 1814-27
Armed: 1827
Disarmed: after 1860
Removed: (extant in 1945)
Facing material: granite ashlar masonry
Diameter: 50 ft.
Height: 31 ft. 9 in.
Wall thickness: 7 ft. 6 in.
Parapet height: not known
Storeys: two

Purpose: to engage enemy naval vessels in the main entrance channel to Halifax harbour.


Sherbrooke Tower on Maugers Beach at the Entrance of Halifax Harbour Nova Scotia 1815

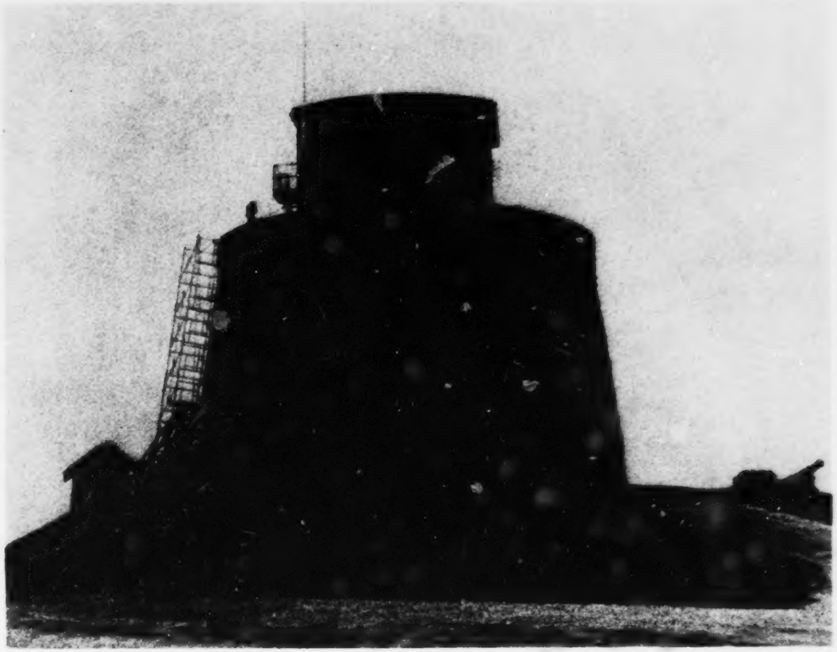
27 Sherbrooke Tower, floor plans, view and section of the completed tower, 1828.
(Public Archives of Canada.)


SHERBROOKE TOWER on MAUGER'S BEACH,
HALIFAX HARBOUR.
completed in 1828.
Plan of the Ground floor shewing the Counter-arches underneath.
Top floor, as temporarily divided, to accommodate a Gunner in charge of the Tower and Man to superintend the Light.
Platform or top of Tower.

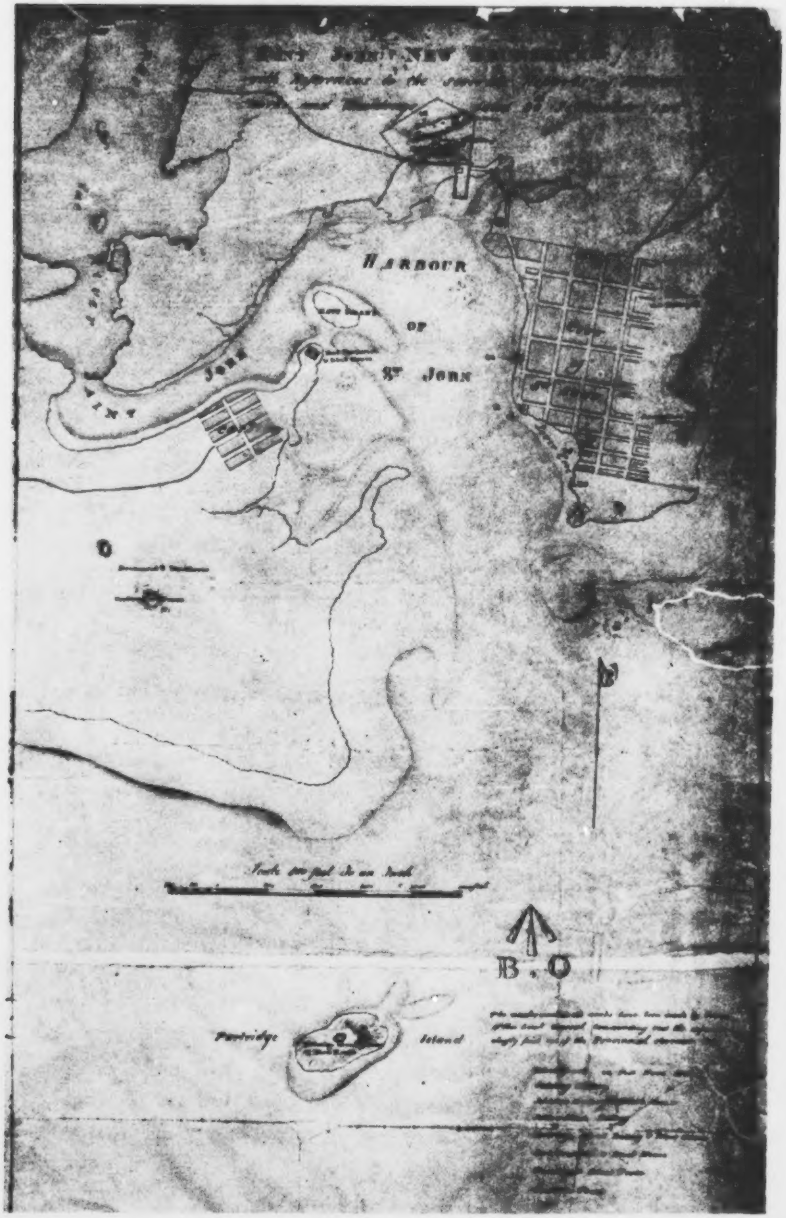
28 Carleton Martello tower, 1971.
(Photograph by author.)

Appendix F. Carleton Tower, Saint John, N.B.

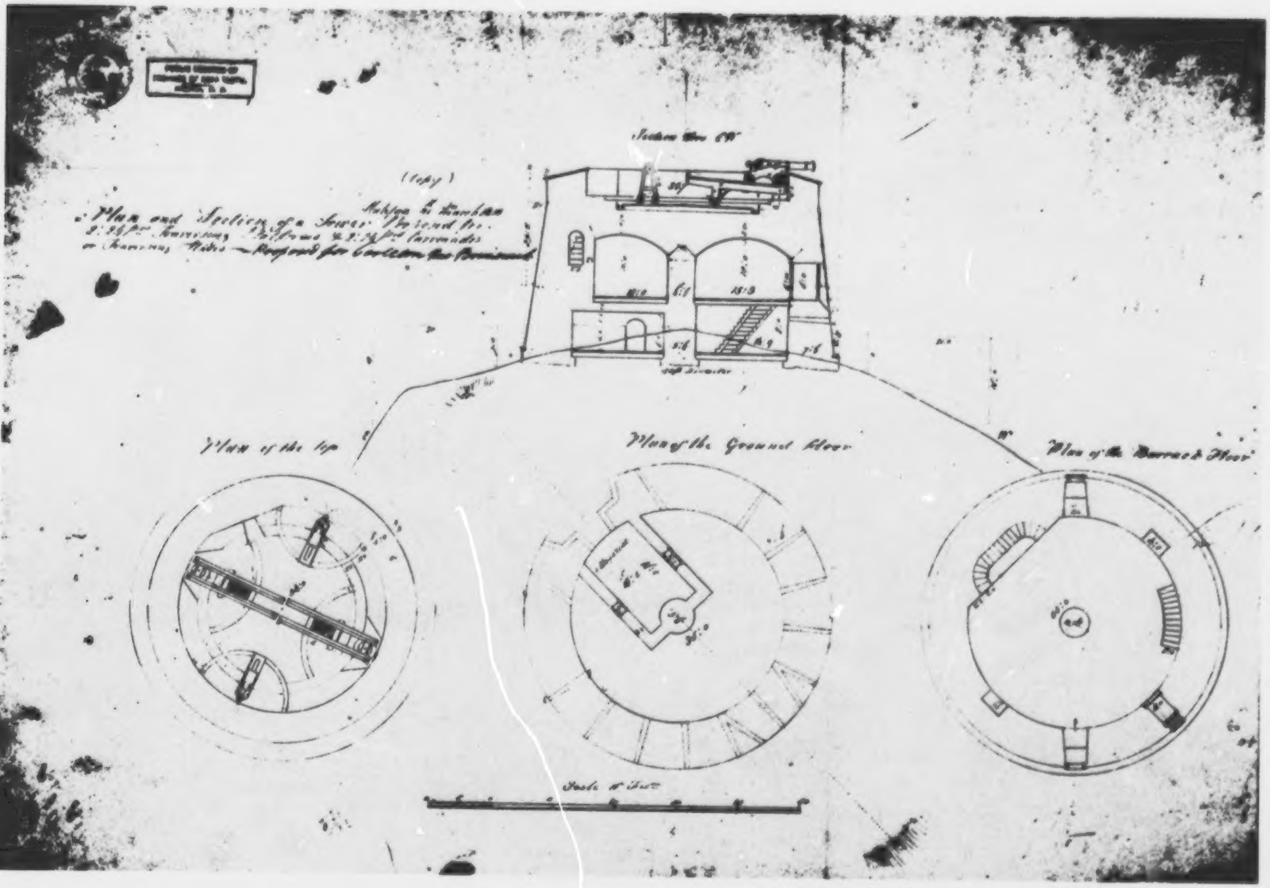
Built: 1813-15
Armed: 1866
Disarmed: after 1877
Demolished: (extant, 1972)
Facing material: rubble masonry
Diameter: 50 ft.
Height: 30 ft.
Wall thickness: 6 ft.
Parapet height: 5 ft.
Storeys: two
Purpose: to defend the western land approaches to the city of Saint John.



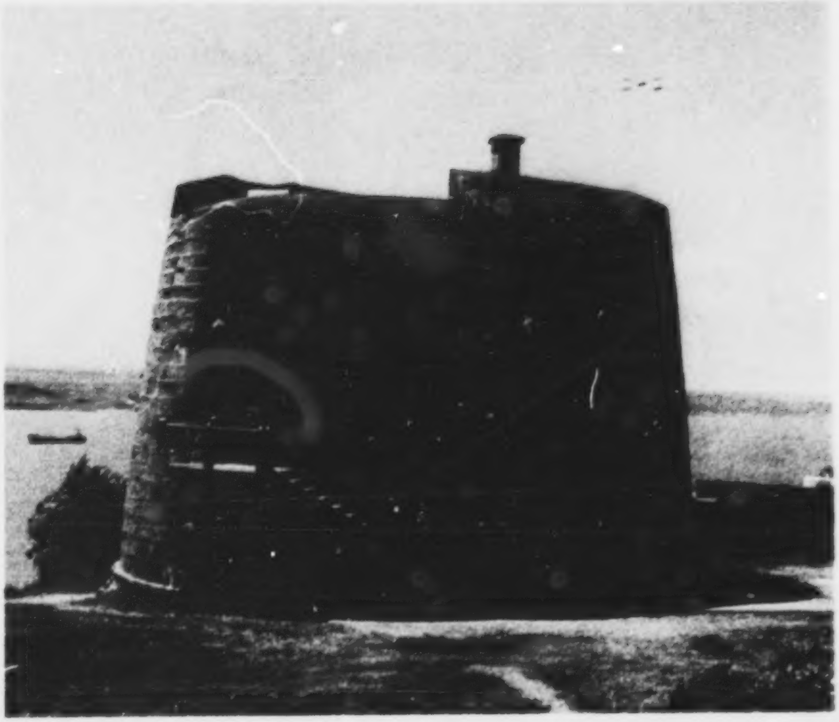
29 Plan of the city of Saint John, N.B., 1815, showing location of new military works.
(Public Archives of Canada.)



Carleton Martello tower; floor plans and section of the proposed tower, 1813.
(Public Archives of Nova Scotia.)


(Copy)
Plan and Section of a Tower Proposed for ... Carleton ...
Plan of the top
Plan of the Ground Floor
Plan of the Barrack Floor
Scale of Feet

31 Tower No. 1, Quebec, 1971.
(Photograph by author.)



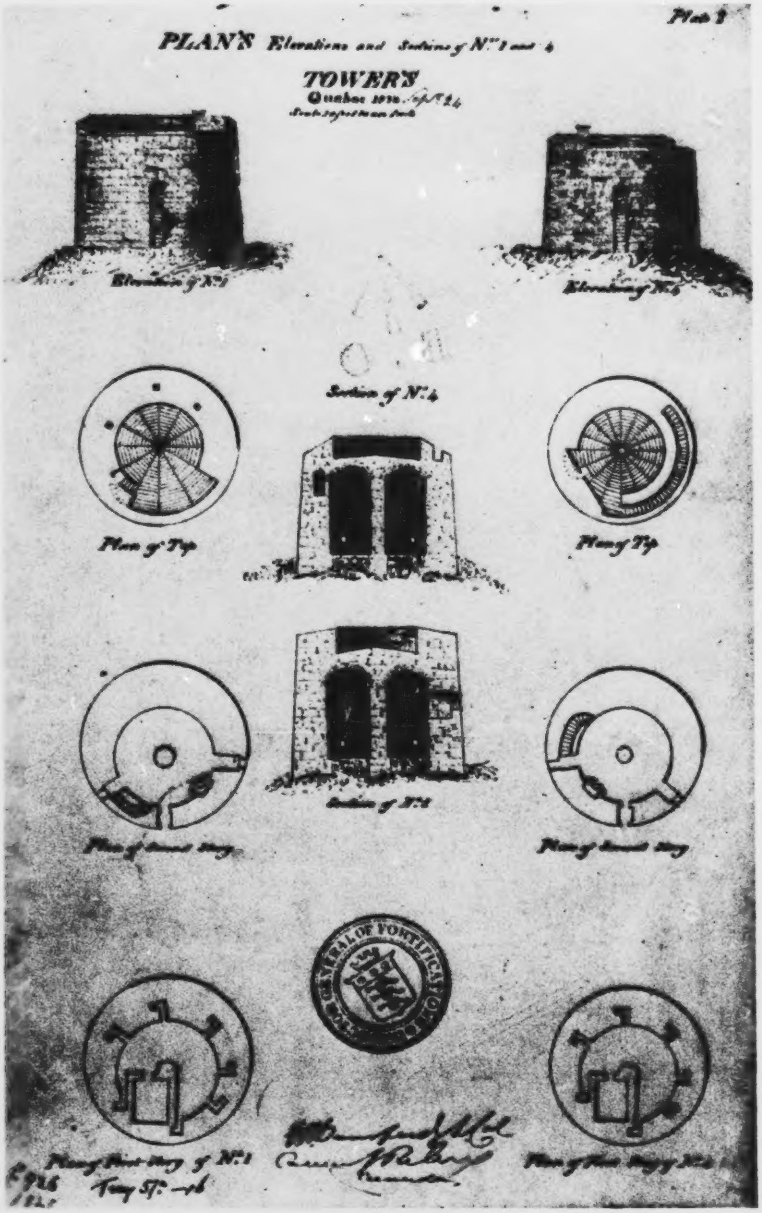
Appendix G. Tower No. 1, Quebec City

Built: 1808-10
Armed: 1810
Disarmed: after 1869
Demolished: (extant, 1972)
Facing material: sandstone ashlar masonry
Diameter: 44 ft. 6 in.
Height: 29 ft. 1 in.
Wall thickness: 6 ft. to 11 ft.
Parapet height: approximately 4 ft. to 6 ft.
Storeys: two
Purpose: to defend the main Quebec works against an attack across the Plains of Abraham. To serve as a keep to a line of emergency fieldworks.
N.B.: *See* Appendix H.

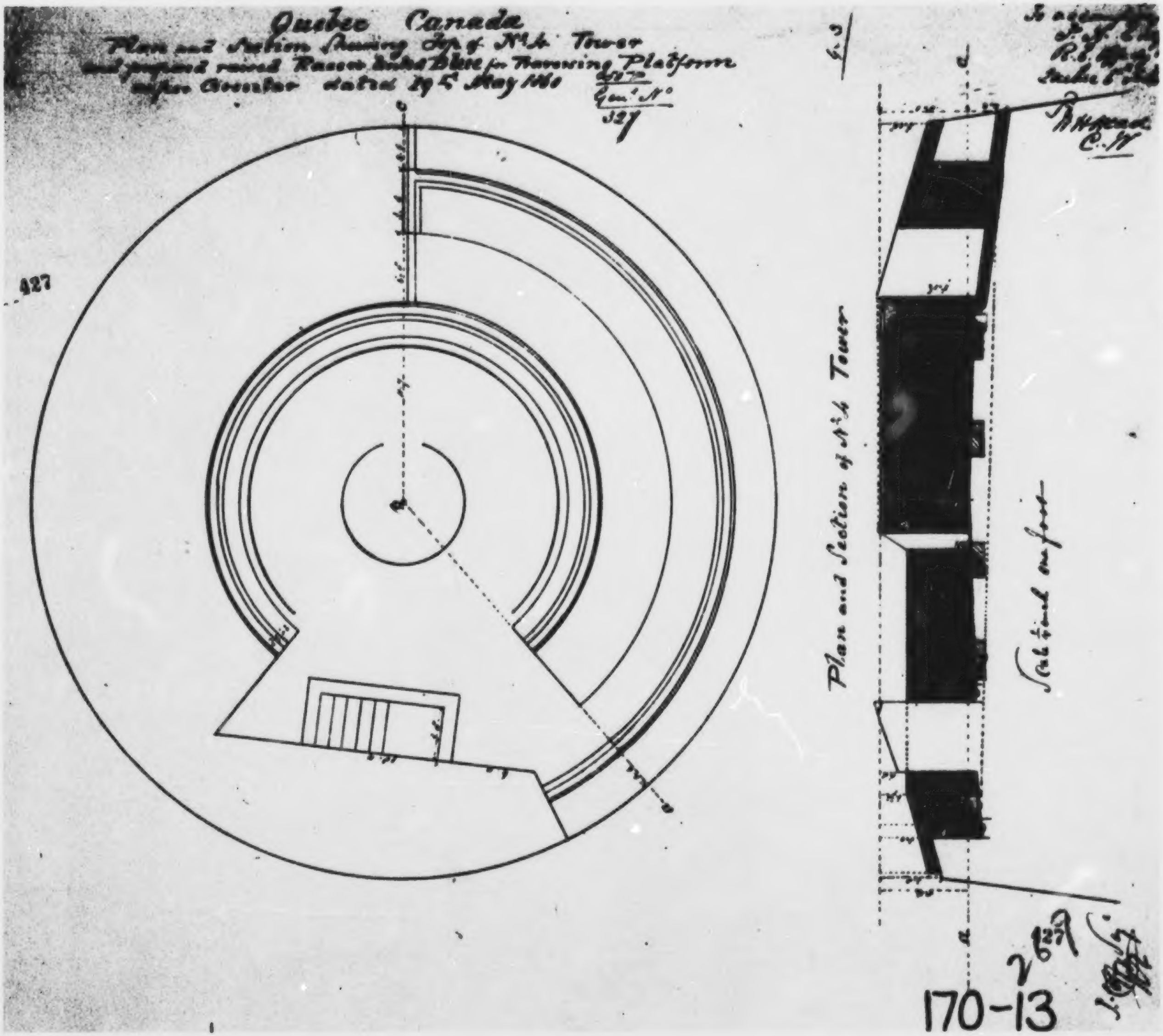
32 Towers No. 1 and 4, Quebec, view, floor plans and section, 1823.
(Public Archives of Canada.)

ppendix H. Tower No. 4, uebec City

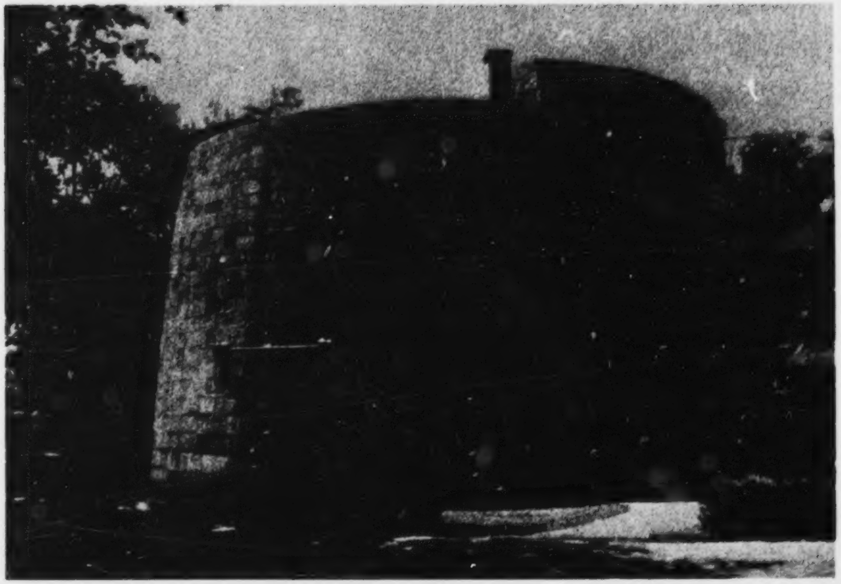
uilt: 1808-12
rmed: 1812
isarmed: top, 1857; interior, after 869
emolished: (extant, 1972)
acing material: sandstone ashlar nasonry
iameter: 42 ft. 6 in.
eight: 26 ft. 6 in.
all thickness: 6 ft. to 11 ft.
arapet height: approximately 4 ft. o 6 ft.
toreys: two
urpose: to defend the main Quebec vorks against an attack across the lains of Abraham; to see into the alley of the Saint-Charles River; o serve as a keep to a line of mergency fieldworks.



33 Tower No. 4, Quebec, plan and section of the platform and parapet, 1866.
(Public Archives of Canada.)


Quebec Canada
Plan and Section Shewing Top of No 4 Tower
and proposed raised Racer and Pivot Stone for Traversing Platform
upon Circular dated 29th May 1866
Genl No
327
427
Plan and Section of No 4 Tower
Scale ¼ inch one foot
170-13

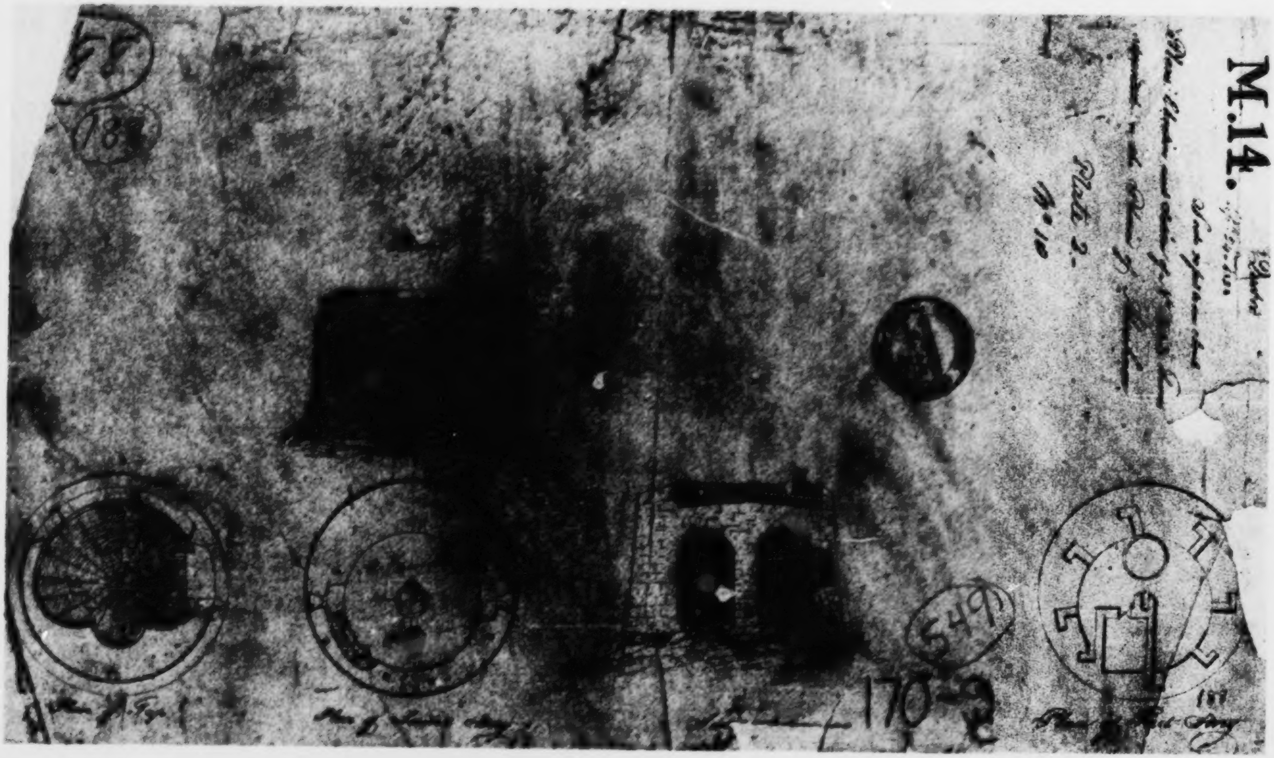
34 Tower No. 2, Quebec, 1971.
(Photograph by author.)



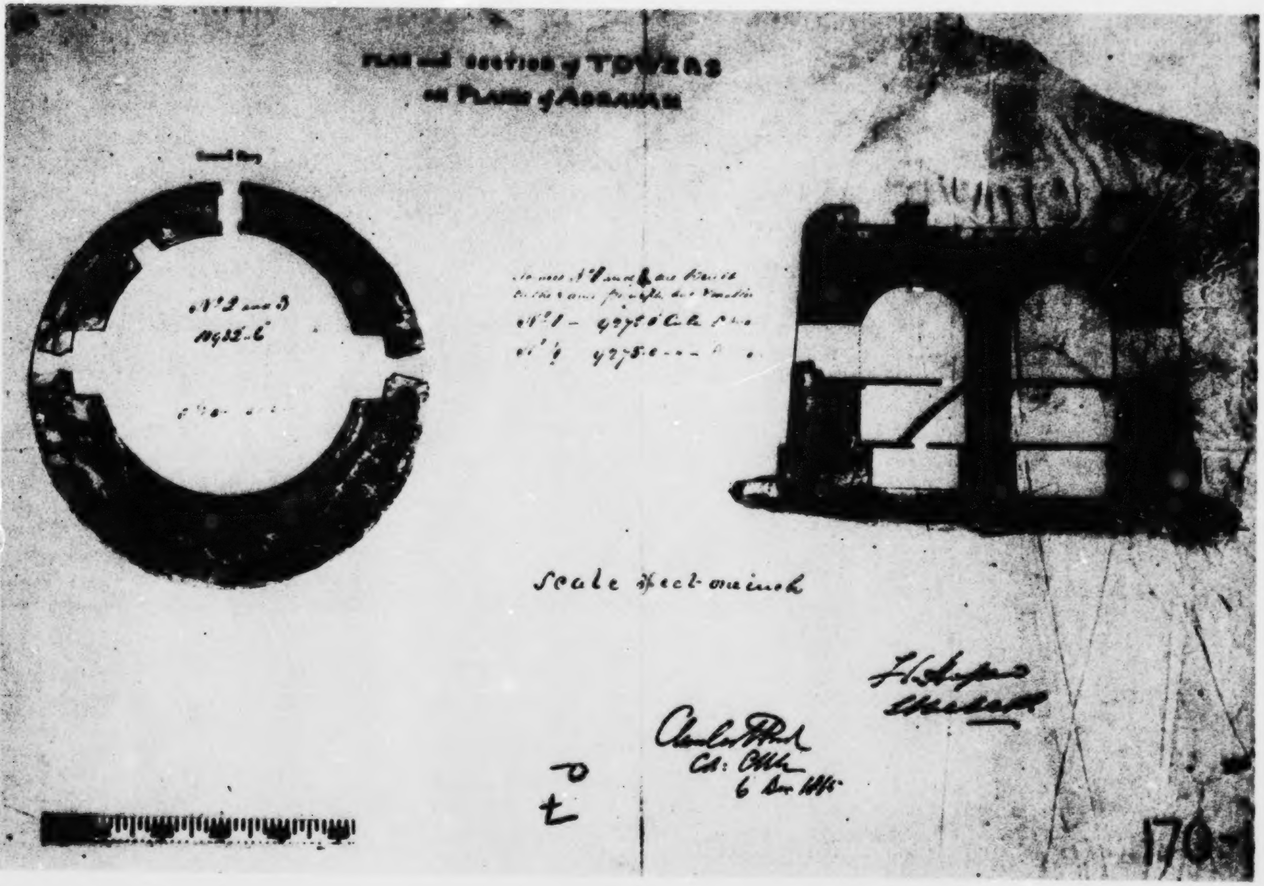
pendix I. Tower No. 2, uebec City

ilt: 1808-10
med: 1810
sarmed: after 1869
molished: (extant, 1972)
cing material: sandstone ashlar
sonry
ameter: 56 ft.
ight: 33 ft.
all thickness: 6 ft. to 11 ft.
rapet height: approximately 4 ft.
6 ft.
oreys: two
rpose: to defend the main Quebec
rks against an attack across the
ains of Abraham. To serve as a
ep to a line of emergency field-
rks.
B.: *See* Appendix J.

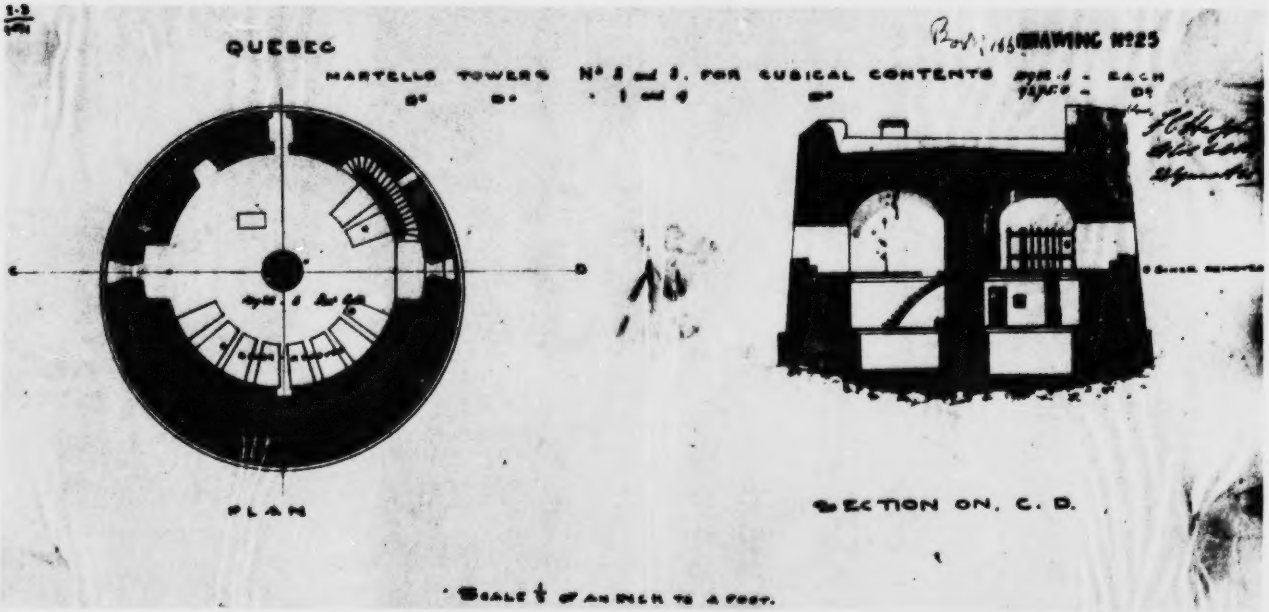
35 Tower No. 2, Quebec, view, section and floor plans, 1823.
(Public Archives of Canada.)



Tower No. 2, Quebec, section and barrack floor plan, 1865.
(Public Archives of Canada.)

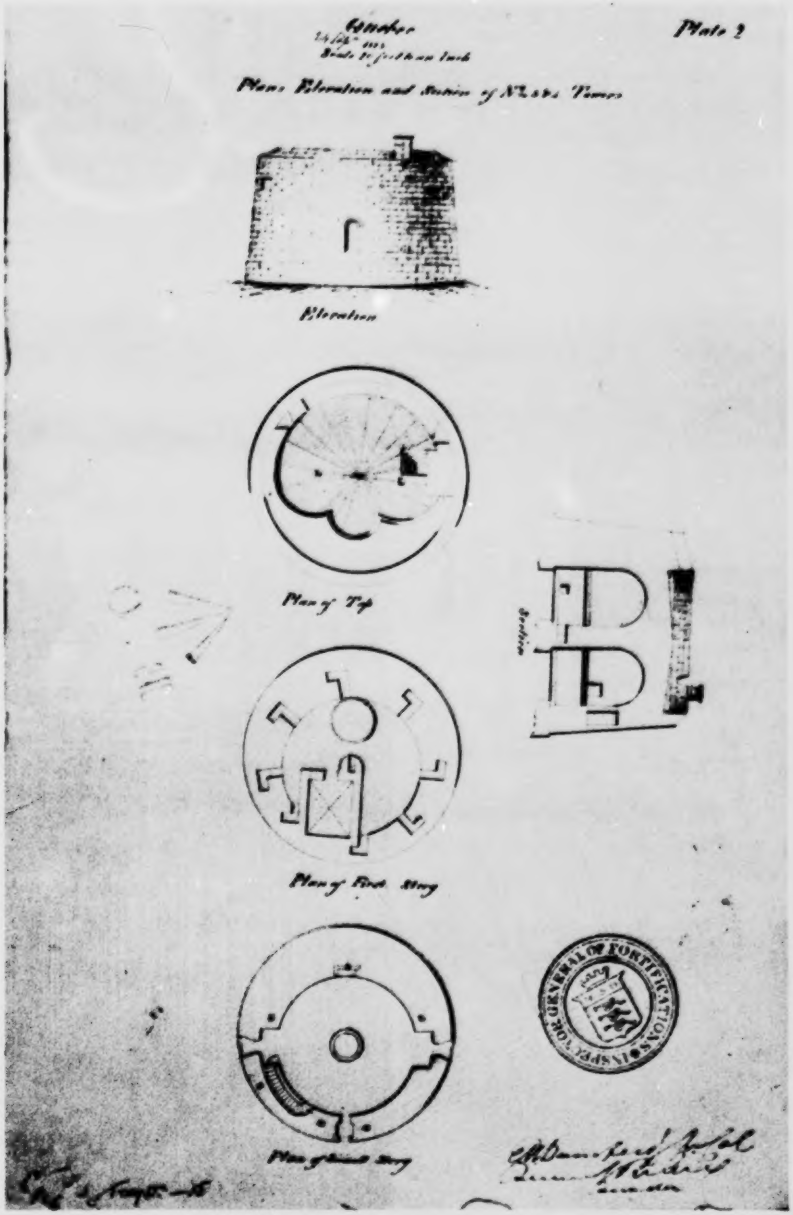


37 Tower No. 2, Quebec, section and barrack floor plan, 1865.
(Public Archives of Canada.)



Appendix J. Tower No. 3, Quebec City

Built: 1808-10
Armed: 1810
Disarmed: top, 1862; interior, after 1869
Demolished: ca. 1900
Facing material: sandstone ashlar masonry
Diameter: 56 ft.
Height: 33 ft.
Wall thickness: 6 ft. to 11 ft.
Parapet height: approximately 4 ft. to 6 ft.
Storeys: two
Purpose: to defend the main Quebec works against an attack across the Plains of Abraham. To serve as a keep to a line of emergency fieldworks.



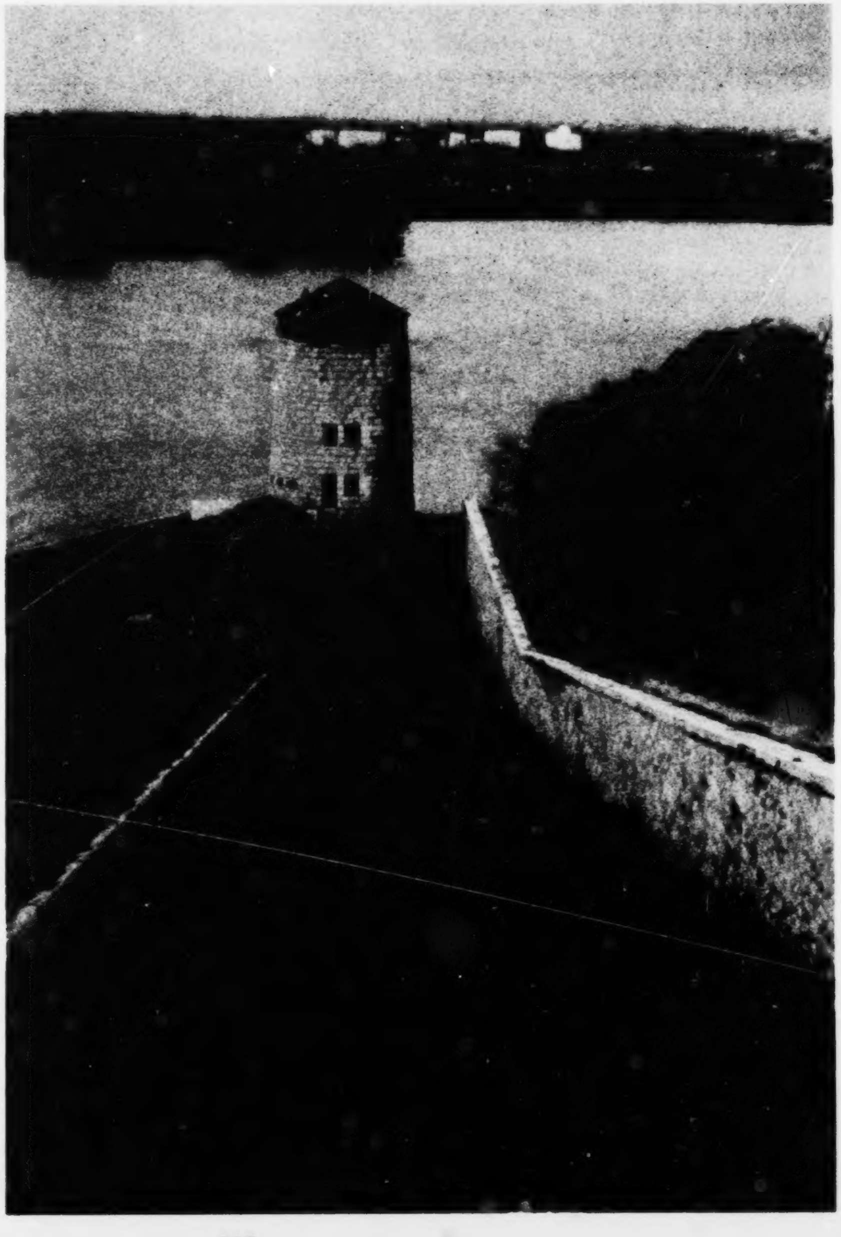
38 Tower No. 3, Quebec, view, section and floor plans, 1823.
(Public Archives of Canada.)

39 West Branch Ditch tower, Kingston, 1971.
(Photograph by author.)

Appendix K. East and West Branch Ditch Towers, Kingston

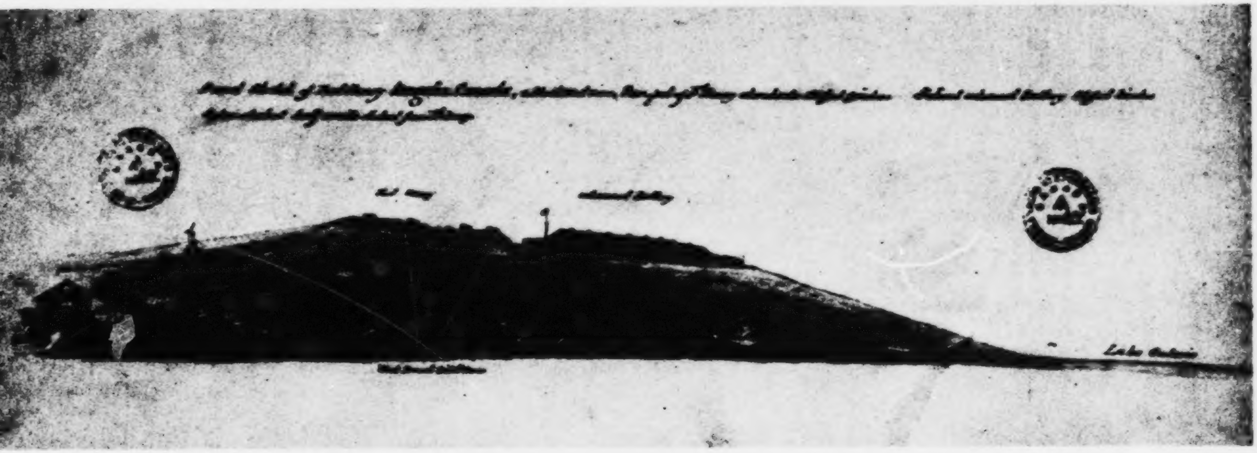
Built: 1845-48
Armed: 1861
Disarmed: date unknown
Demolished: (extant, 1972)
Facing material: limestone ashlar masonry
Diameter: approximately 30 ft.
Height: 45 ft.
Wall thickness: up to 8 ft.
Parapet height: 6 ft.
Storeys: three
Purpose: to flank the branch ditches of Fort Henry and the shoreline around Point Henry.

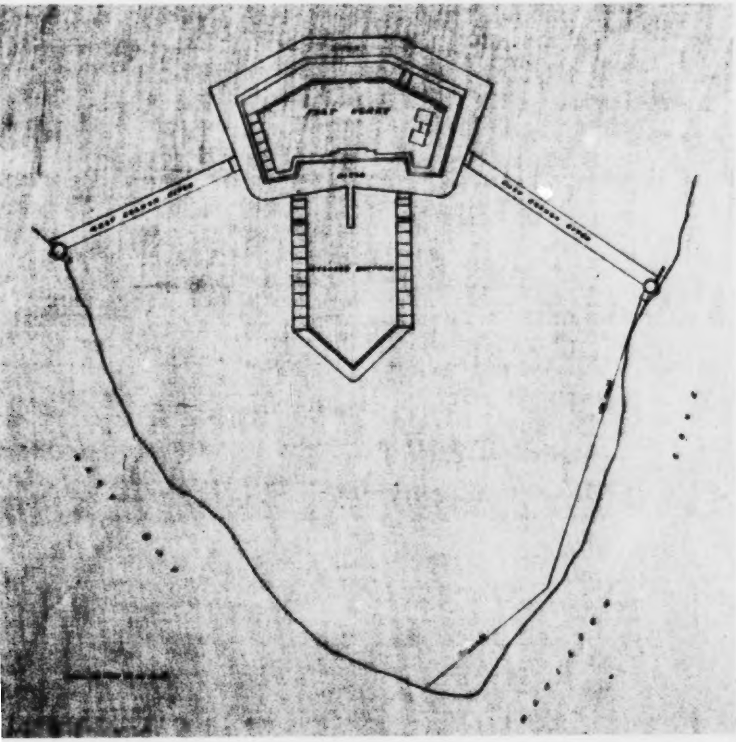
39



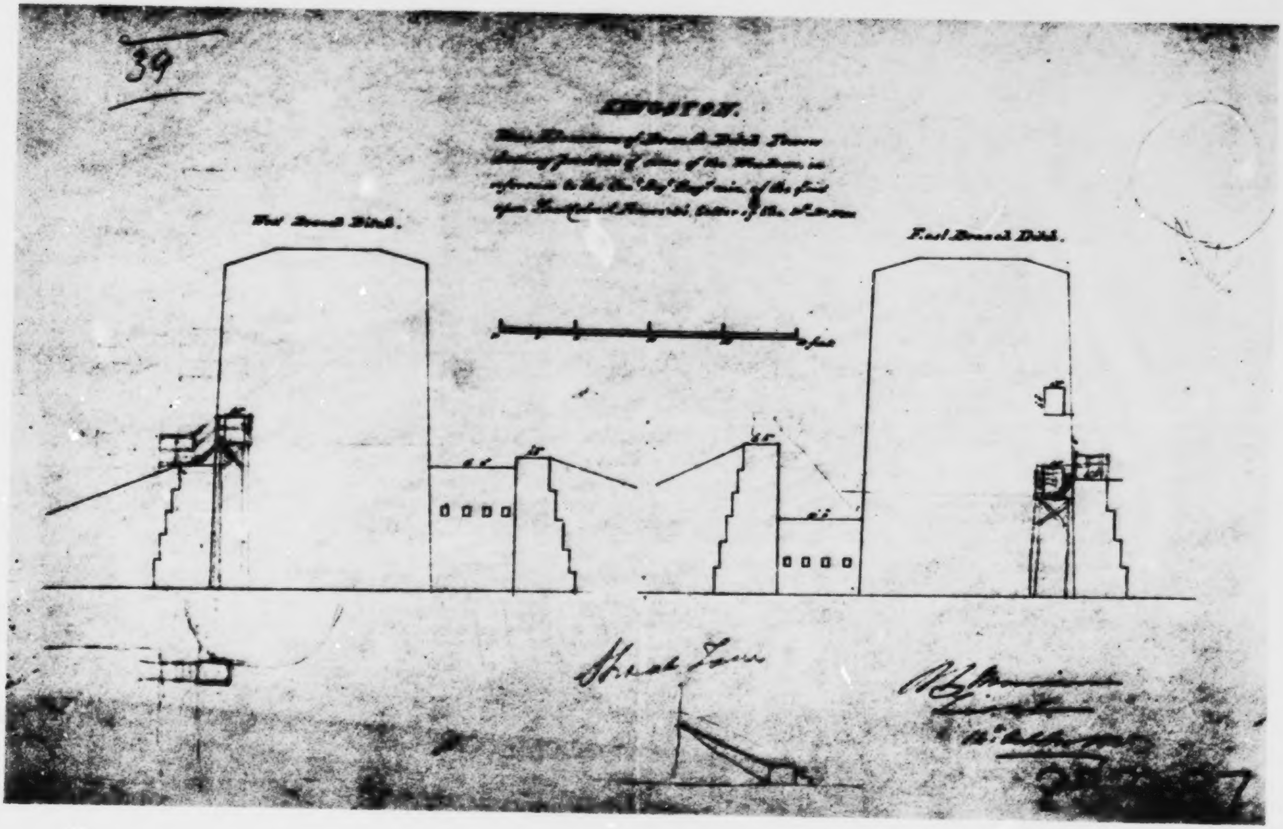
iew of Point Henry, Kingston, illustrating the
elationship of Fort Henry and the West Branch
)itch tower, 1859.
Public Archives of Canada.)

41 Plan of Point Henry, Kingston, showing the relationship between Fort Henry and the Branch Ditch towers, n.d.
(Public Archives of Canada.)

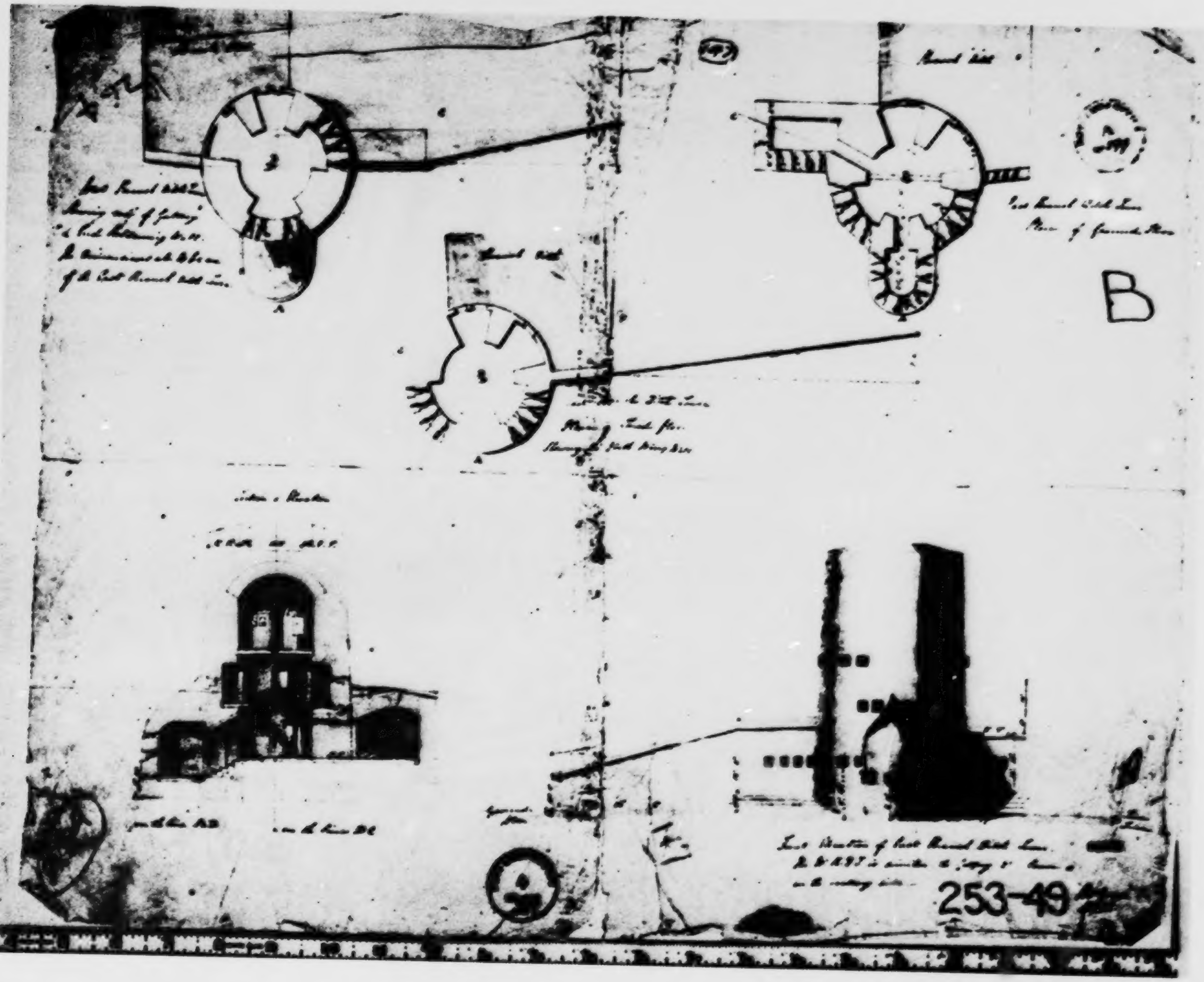




42 Branch Ditch towers, Kingston, views illustrating the proposed means of entry, 1848.
(Public Archives of Canada.)

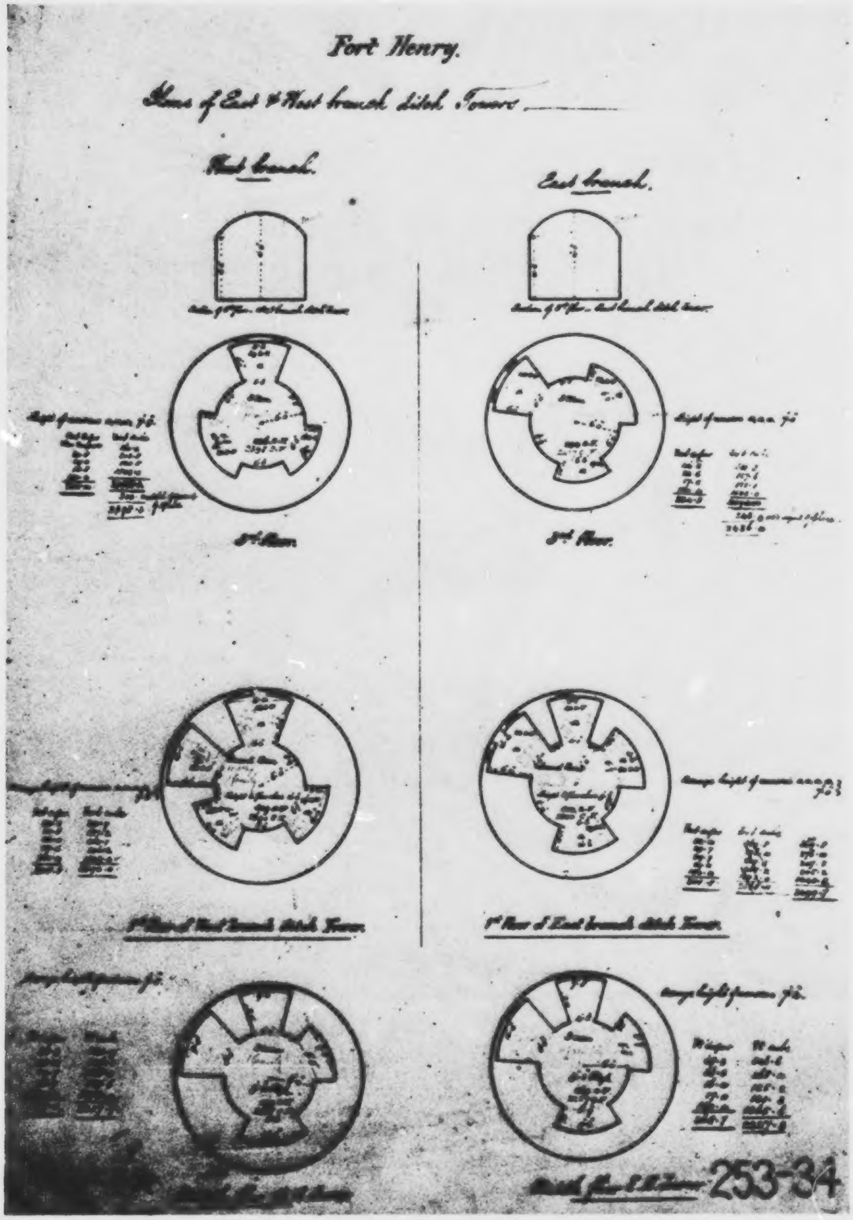


3 Branch Ditch towers, Kingston, section view and floor plans of the towers, n.d. *(Public Archives of Canada.)*



44 Branch Ditch towers, Kingston, floor plans showing barrack accommodation, n.d. For armament, *see* Fig. 70.
(Public Archives of Canada.)

44


Fort Henry.
Plans of East & West branch ditch Towers
West branch.
East branch.
3rd Floor.
3rd Floor.
1st Floor of West branch ditch Tower.
1st Floor of East branch ditch Tower.
253-34

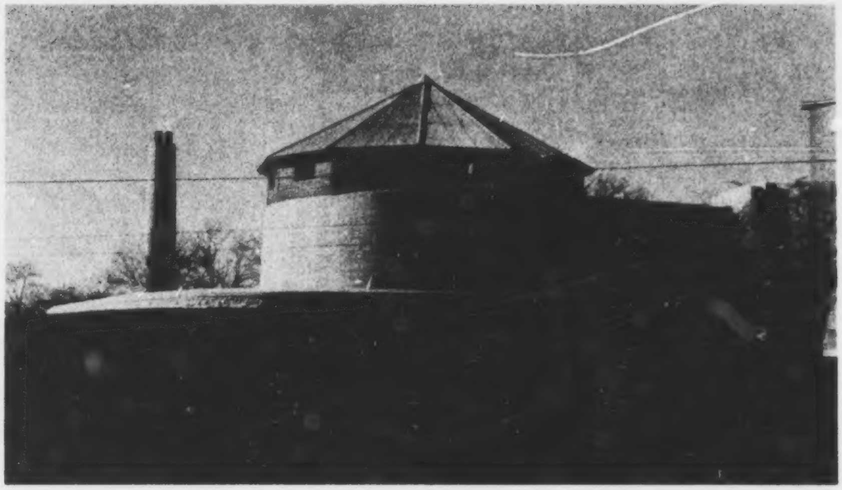
Murney Tower, 1971.
(Photograph by author.)

46 Murney Tower, ditch and caponiers, 1971.
(Photograph by author.)

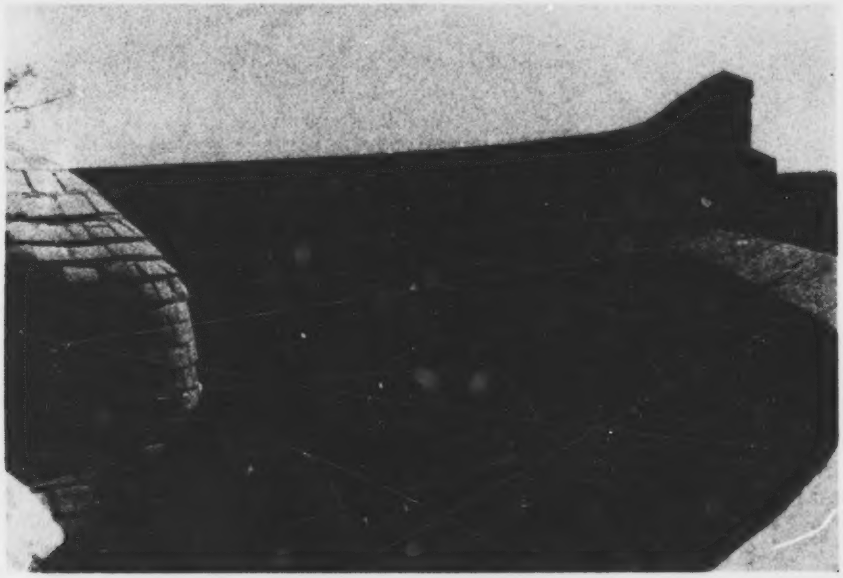
Appendix L. Murney Tower, Kingston

Built: 1846
Armed: 1861
Disarmed: date unknown
Demolished: (extant, 1972)
Facing material: limestone ashlar masonry
Diameter: 56 ft.
Height: 36 ft.
Wall thickness: 8 ft. to 14 ft.
Parapet height: 6 ft.
Storeys: two
Purpose: to anchor the flank of a fieldwork line around the town. To engage enemy shipping entering Kingston harbour.

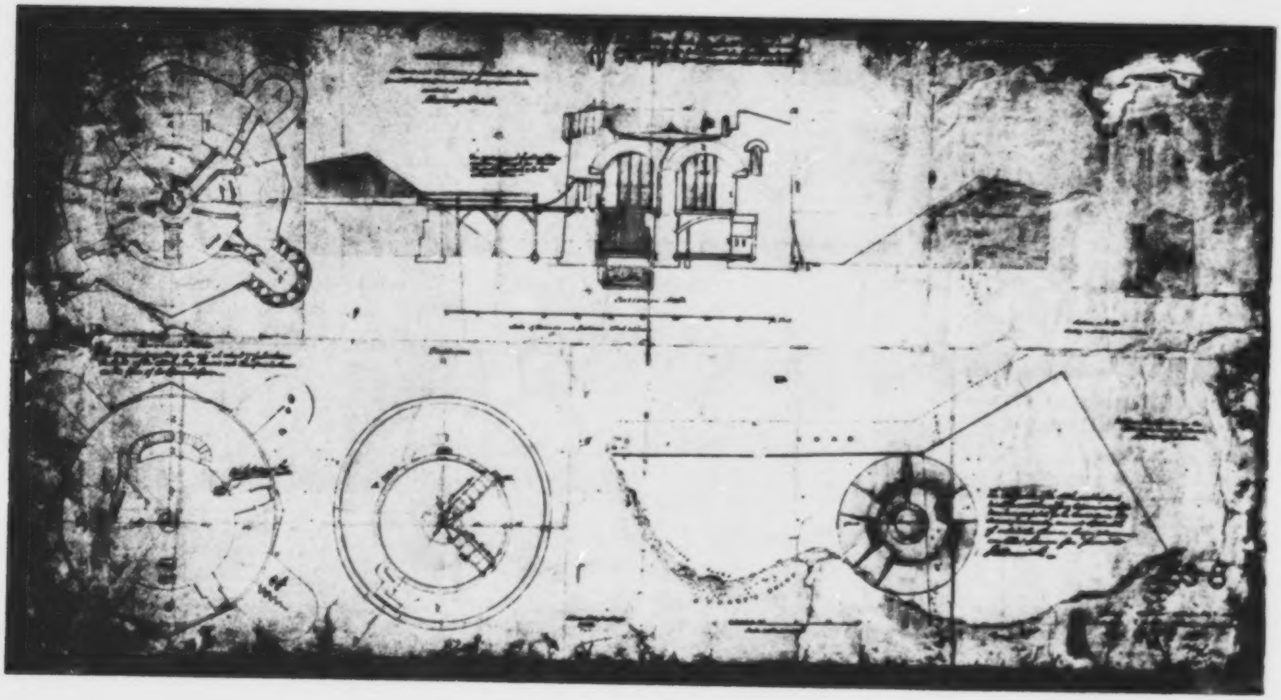
45



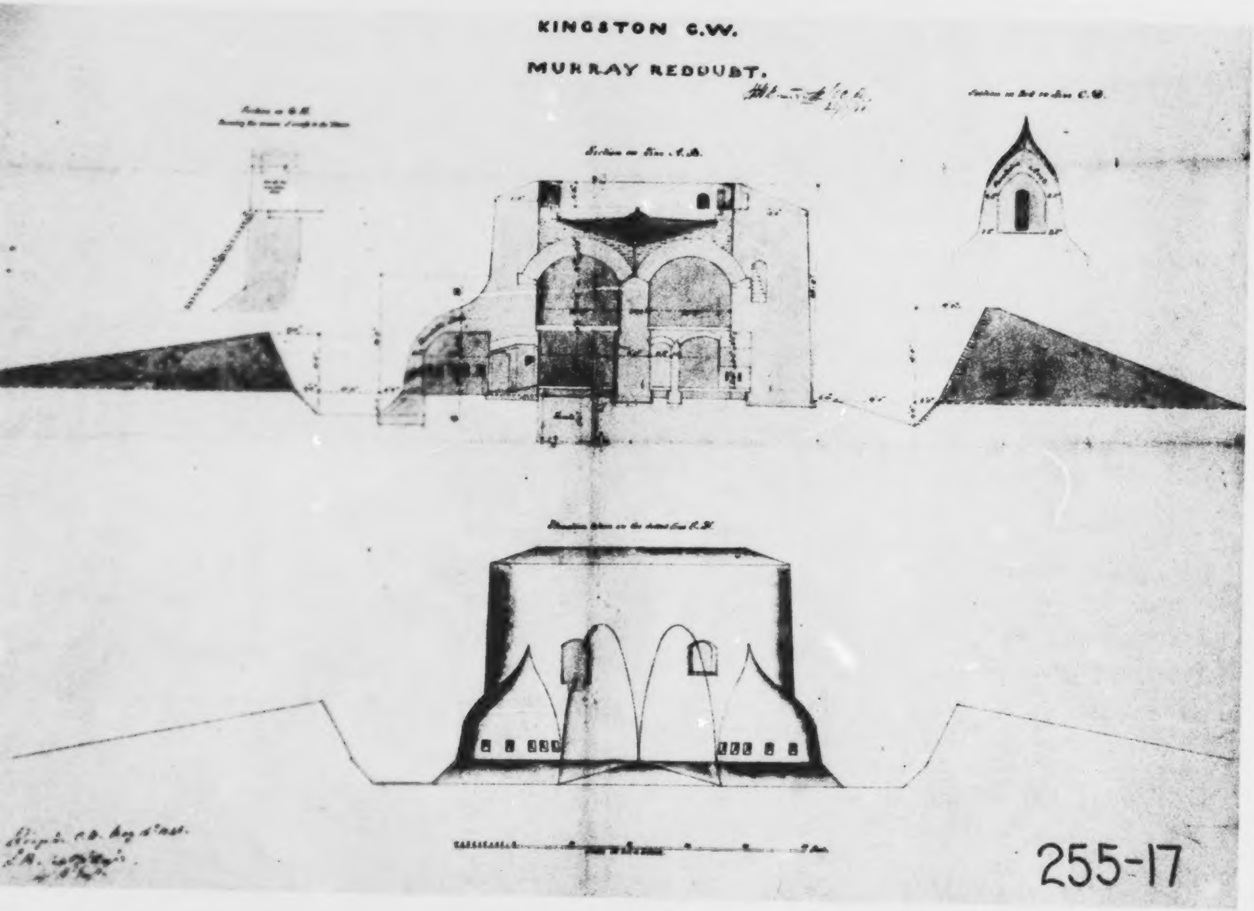
46



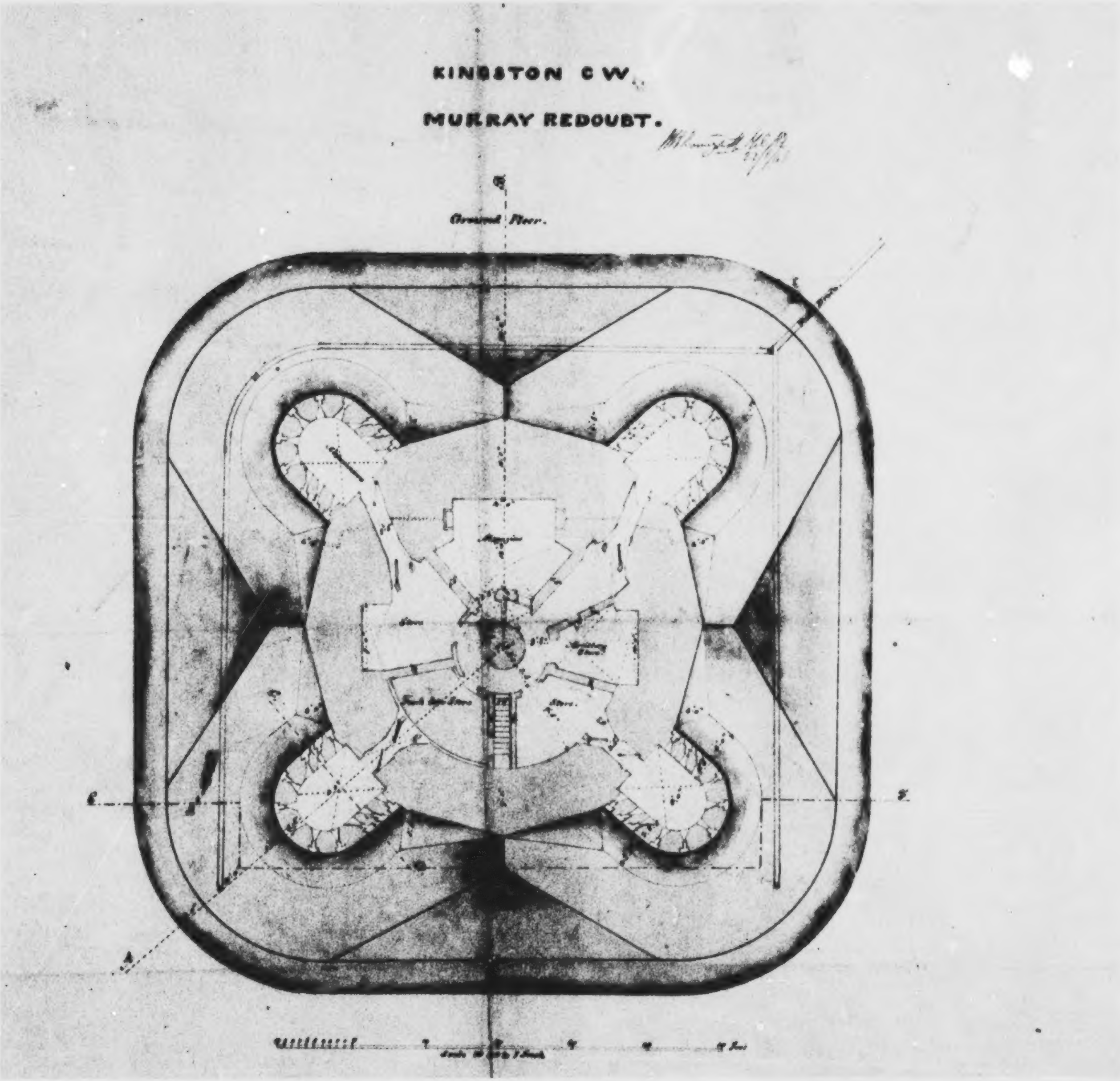
47 Murney Tower, section and floor plans of the proposed tower, 1845.
(Public Archives of Canada.)



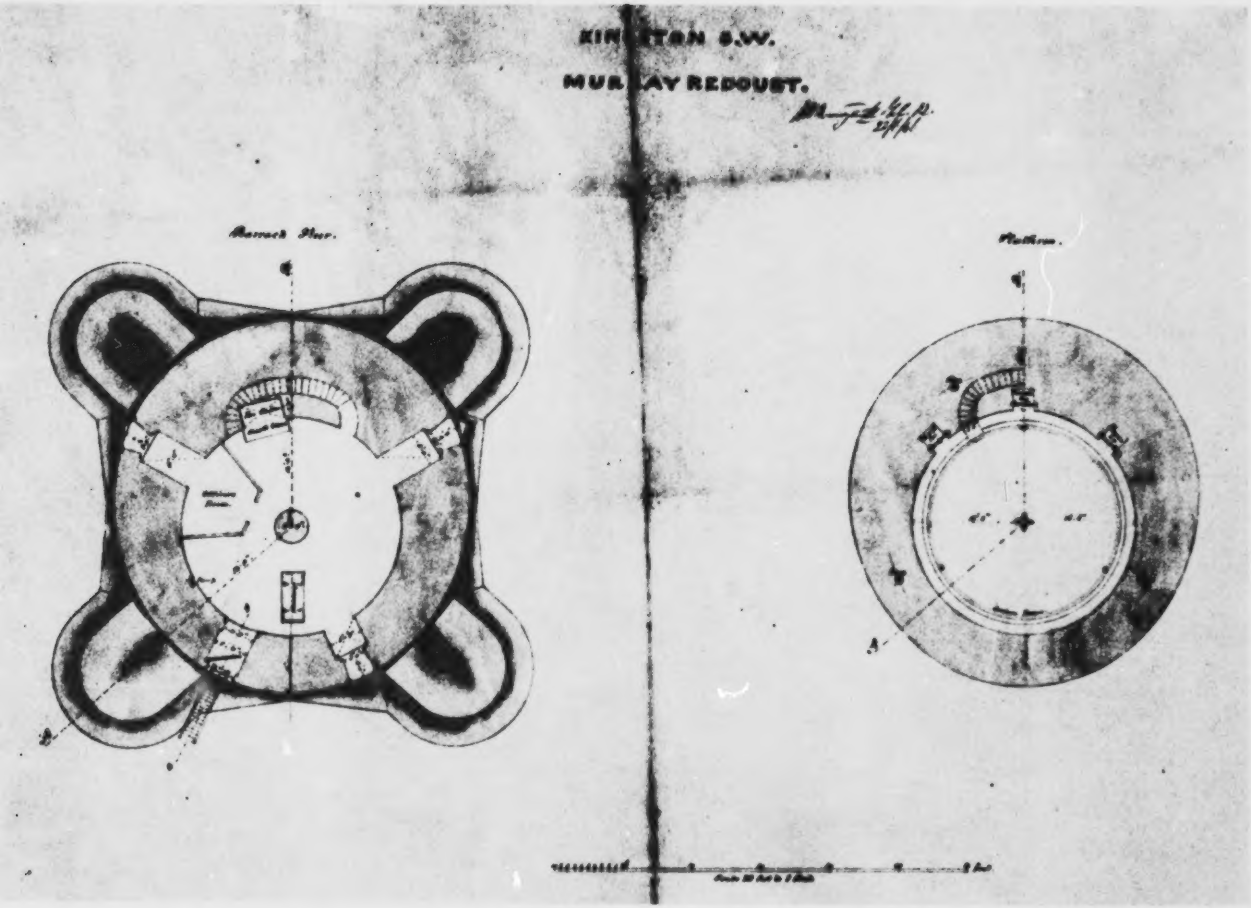
Murney Tower, elevation and section showing the proposed means of access and the form of the caponiers, 1846.
(Public Archives of Canada.)



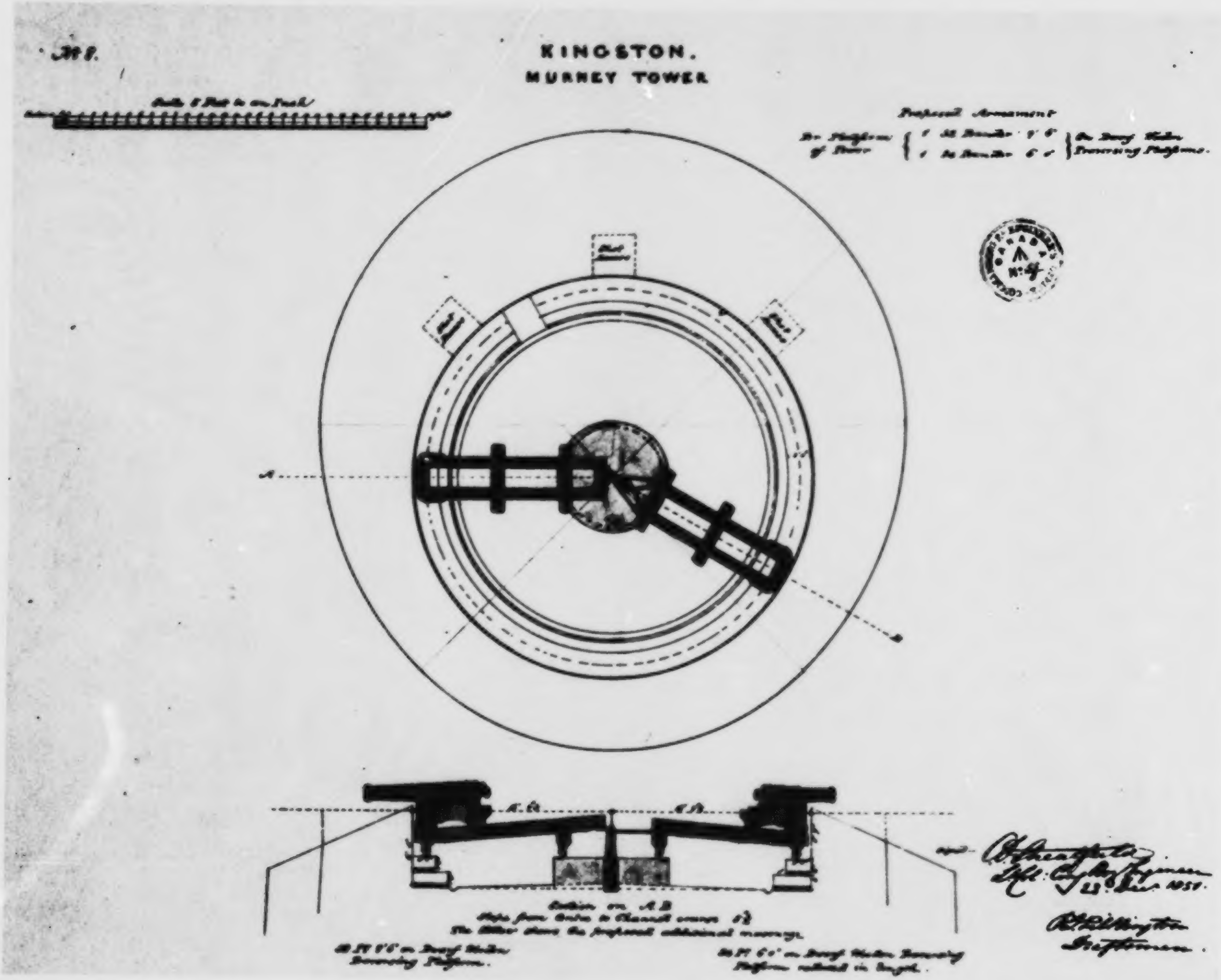
49 Murney Tower, basement floor plan, May, 1846.
(Public Archives of Canada.)



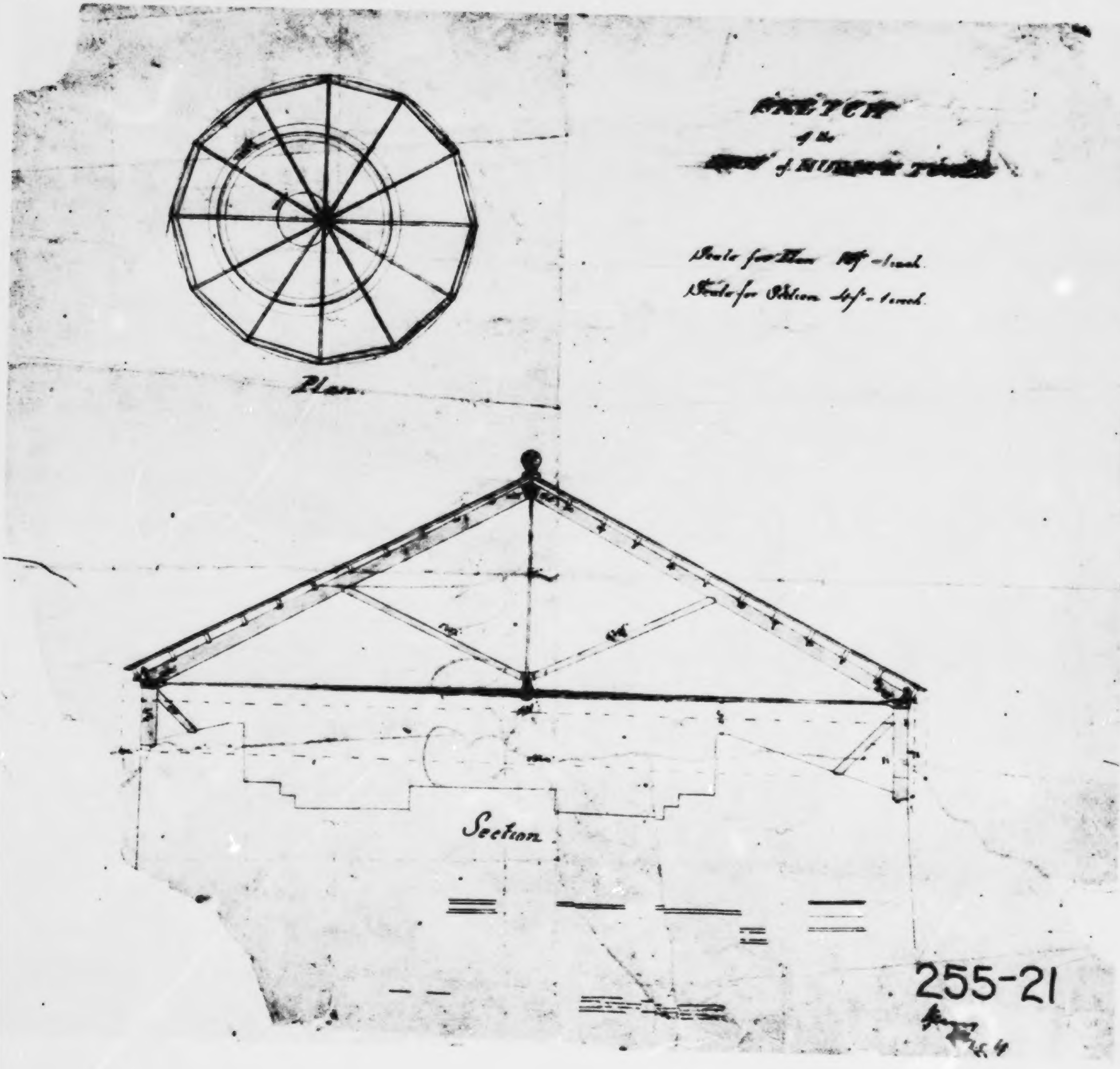
lurney Tower, barrack floor and platform plans,
lay, 1846.
Public Archives of Canada.)



51 Murney Tower, platform plan and section showing the proposed method of arming the tower, 1851. *(Public Archives of Canada.)*



52 Murney Tower, plan and section of the proposed new roof of the tower, 1867.
(Public Archives of Canada.)

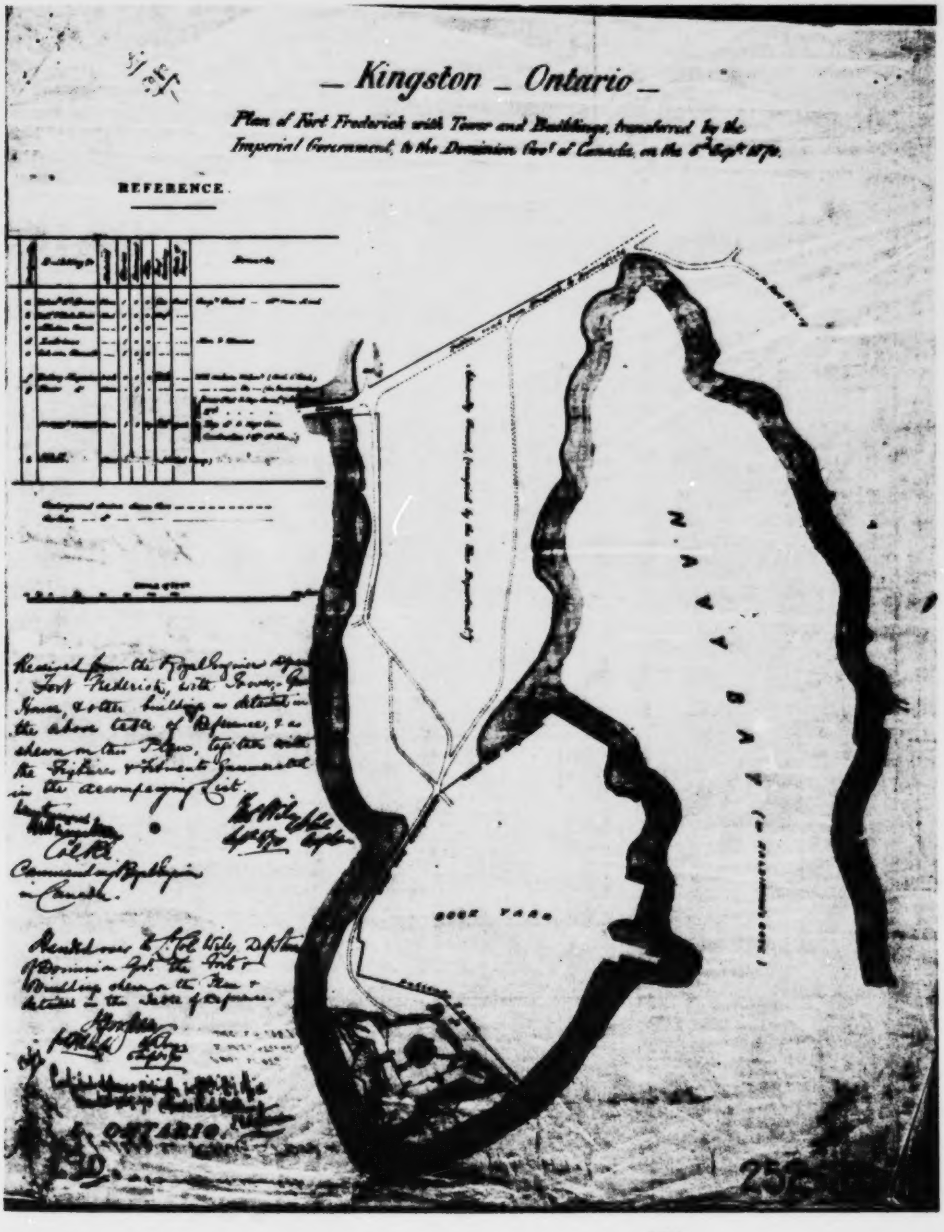

SKETCH
of the
Scale for Plan 10ft = 1 inch.
Scale for Section 4ft = 1 inch.
Plan.
Section
255-21

Appendix M. Fort Frederick Tower, Kingston

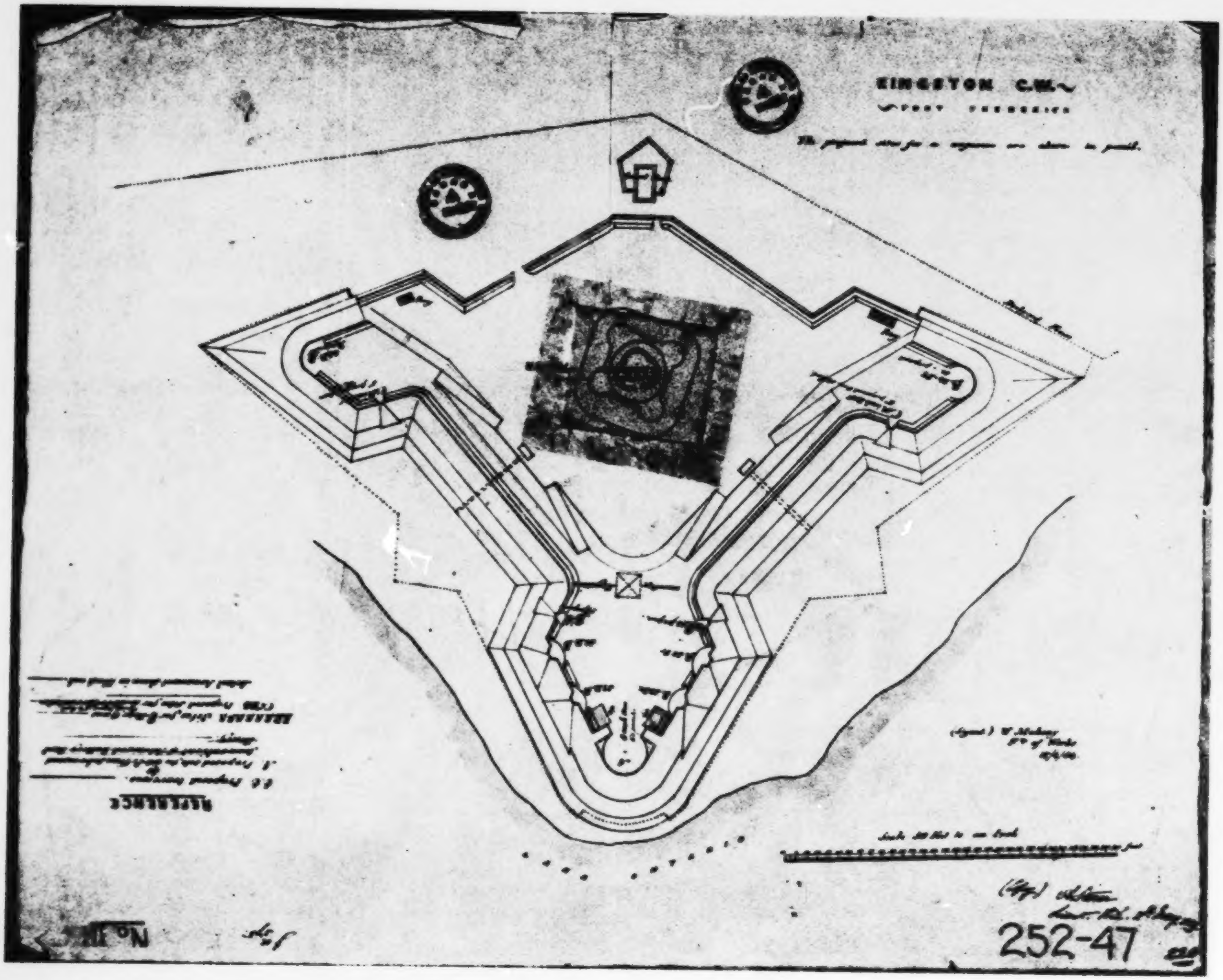
Built: 1846-47
Armed: 1862
Disarmed: date unknown
Demolished: (extant, 1972)
Facing material: limestone ashlar masonry
Diameter: 60 ft.
Height: 45 ft.
Wall thickness: 9 ft. to 15 ft.
Parapet height: 6 ft.
Storeys: three
Purpose: to serve as a barrack and keep to Fort Frederick; to function as an offensive sea battery; to sweep the Point Frederick shoreline.

53 Fort Frederick tower, 1971.
(Photograph by author.)

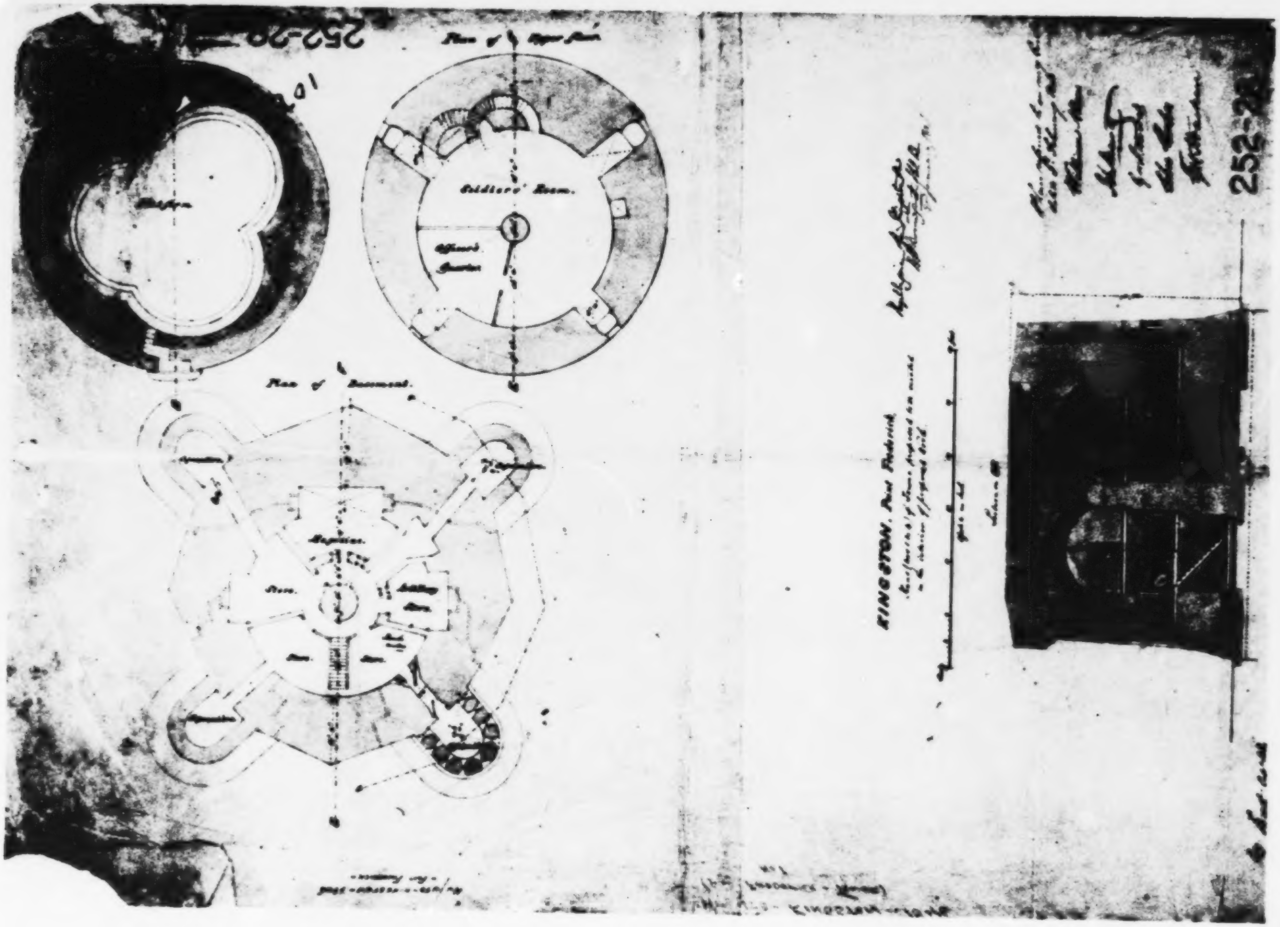
4 Plan of Point Frederick showing the location of the fort and tower, 1870. *(Public Archives of Canada.)*


_ Kingston _ Ontario _
Plan of Fort Frederick with Tower and Buildings, transferred by the Imperial Government, to the Dominion Govt of Canada, on the 6th Sept 1870.
REFERENCE.
NAVY BAY
DOCK YARD
Received from the Royal Engineer Dept Fort Frederick, with Tower, Guard House, & other buildings as detailed in the above table of Reference, & as shown on this Plan, together with the Fixtures & Fitments enumerated in the accompanying List.
Col. R.E.
Commanding Royal Engineers in Canada.
Handed over to [illegible] Wily Dept. of Dominion Govt. the Fort & Buildings shown on the Plan & detailed in the Table of Reference.
ONTARIO
25

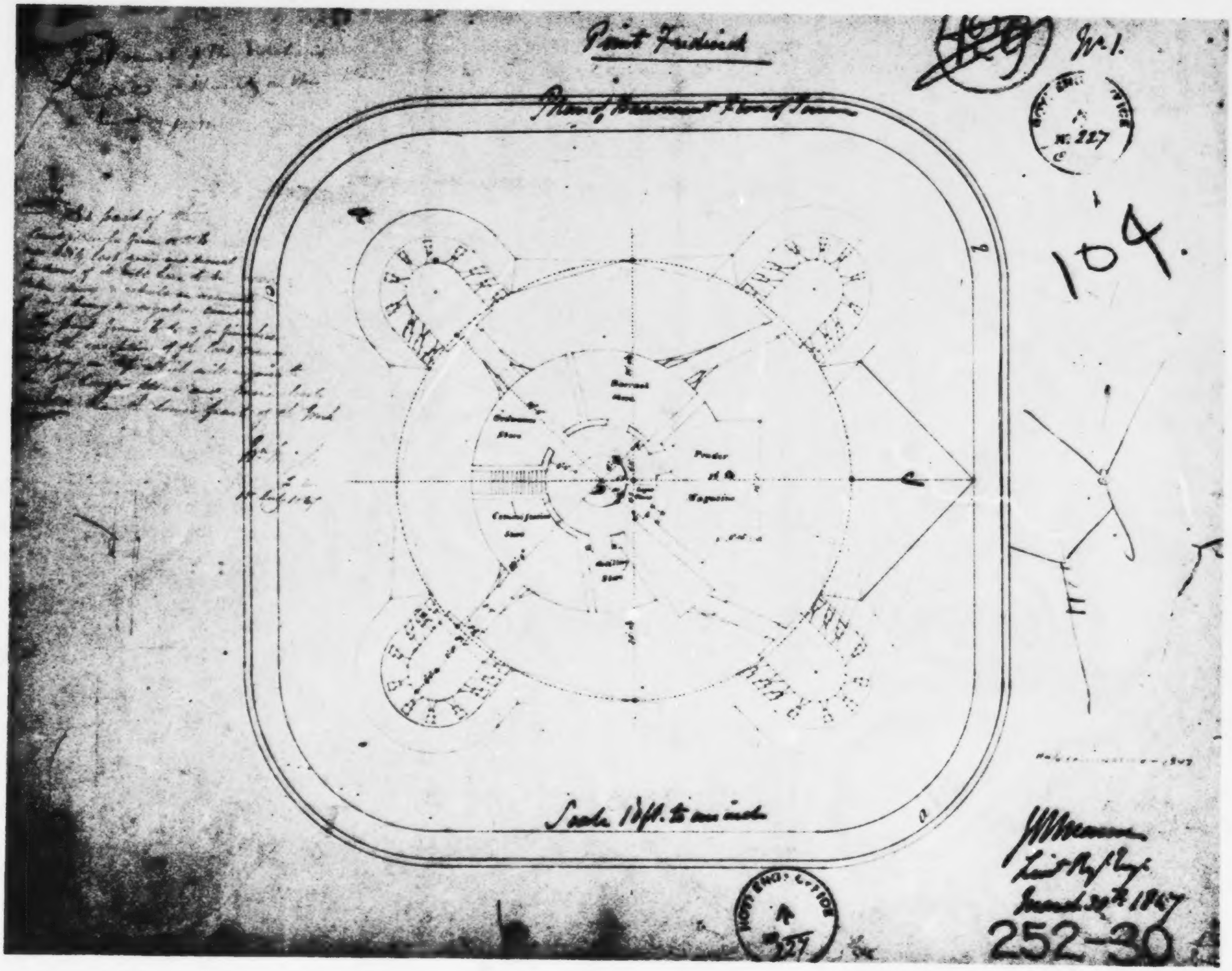
55 Plan of Fort Frederick and tower, 1859.
(Public Archives of Canada.)



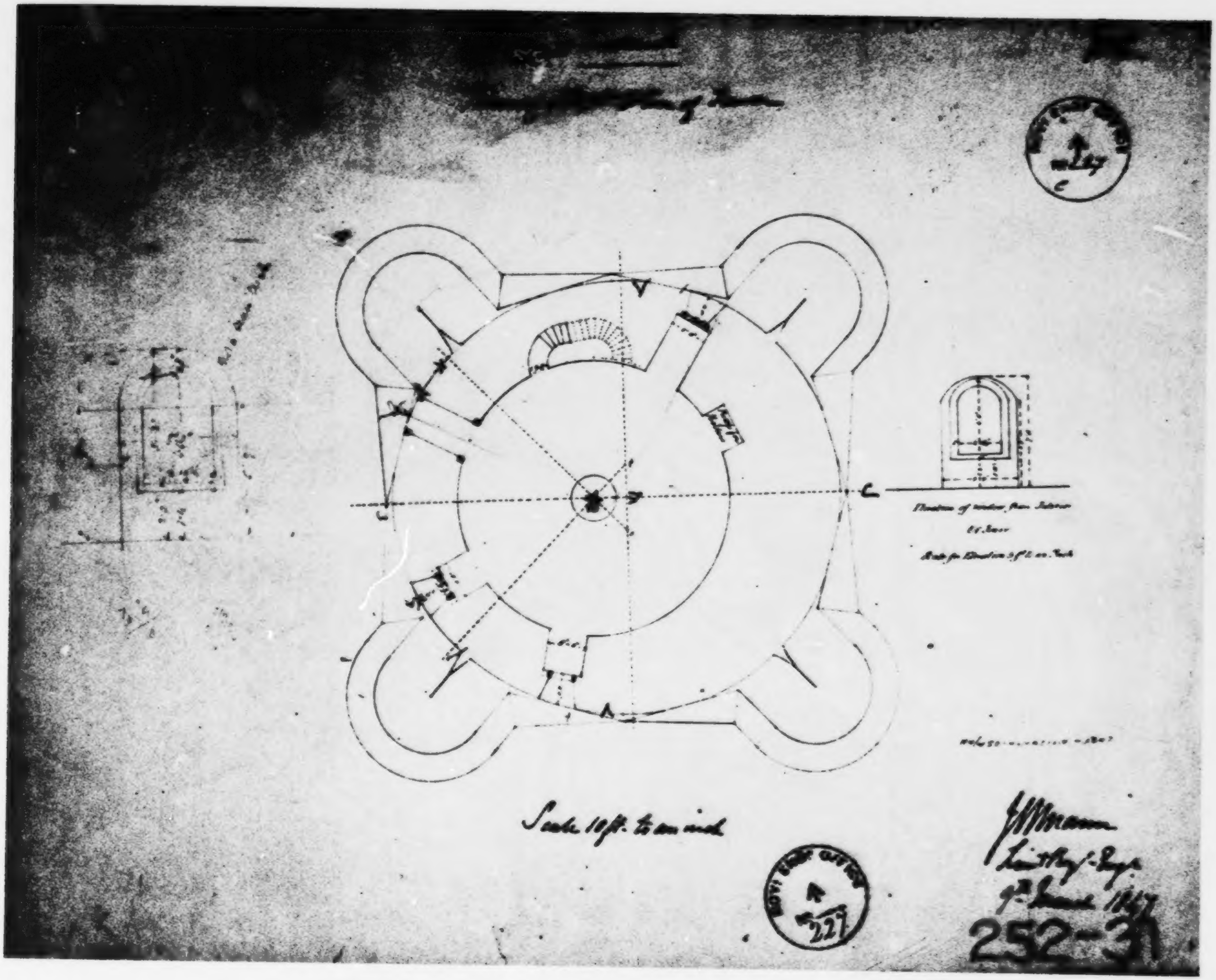
56 Fort Frederick tower, section and floor plans, 1846.
(Public Archives of Canada.)



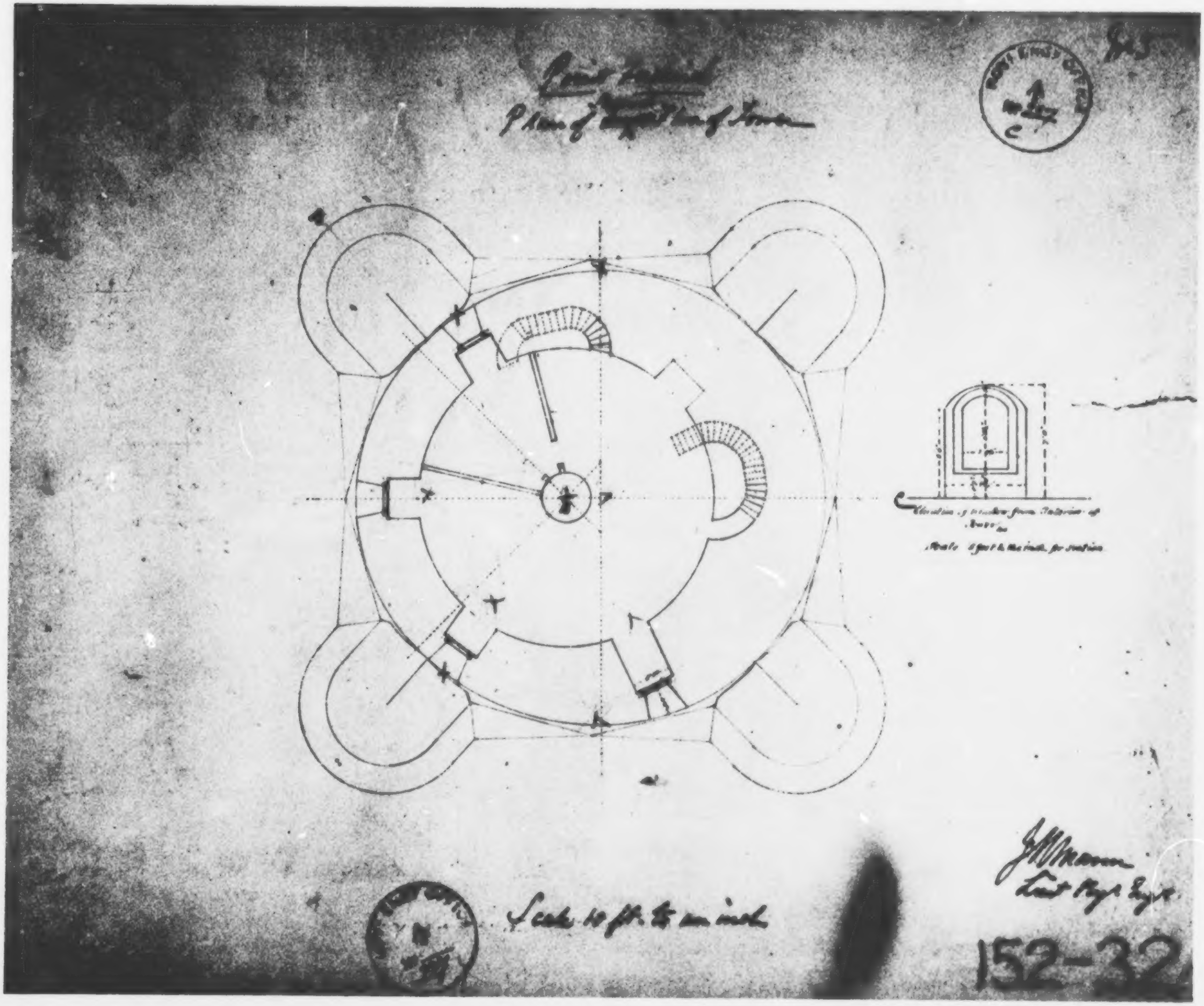
57 Fort Frederick tower, basement floor plan, 1846.
(Public Archives of Canada.)

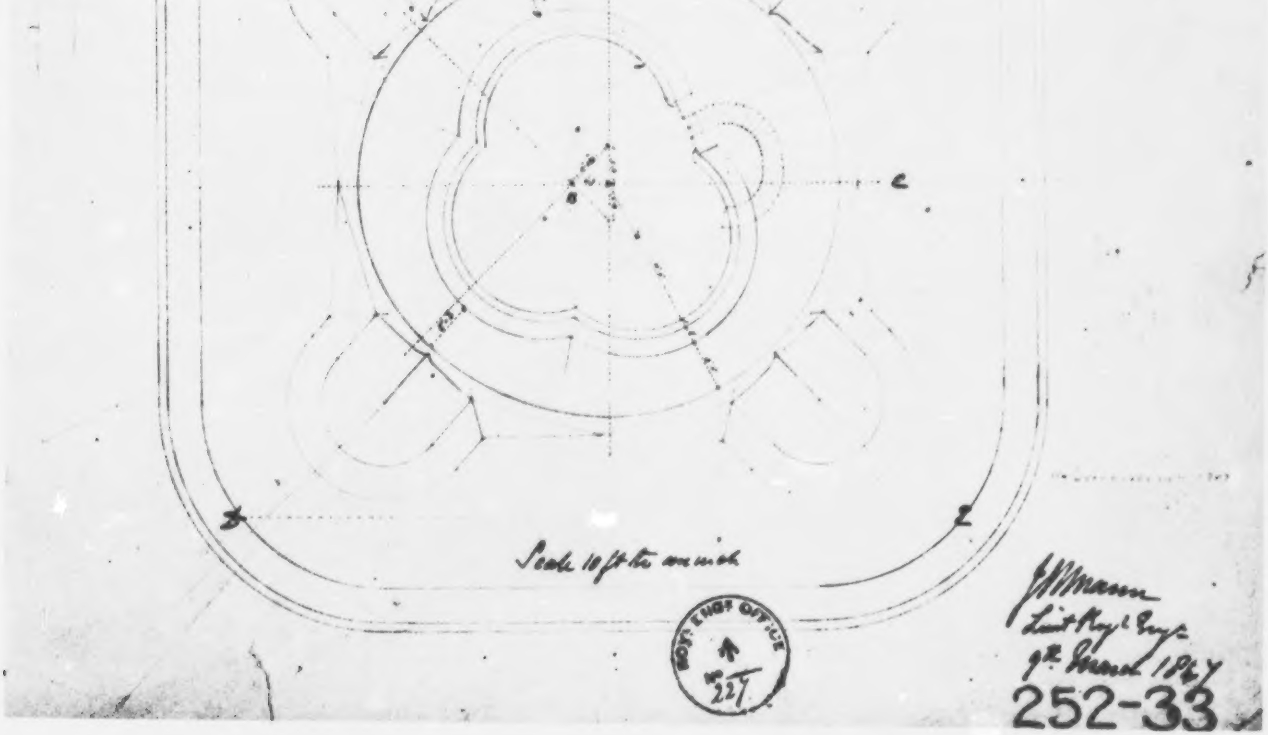


58 Fort Frederick tower, lower barrack floor plan, 1846.
(Public Archives of Canada.)



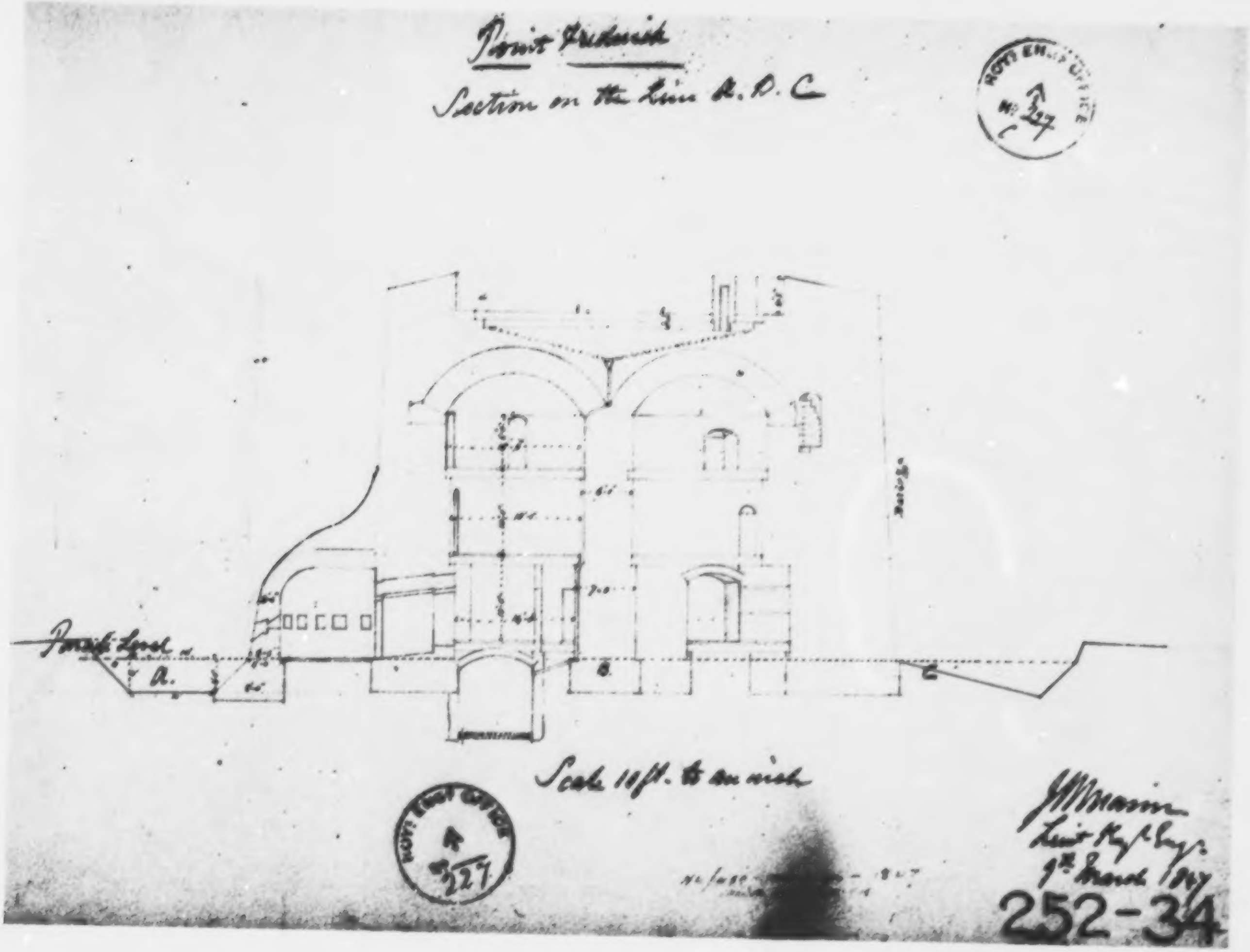
59 Fort Frederick tower, upper barrack floor plan, 1846.
(Public Archives of Canada.)

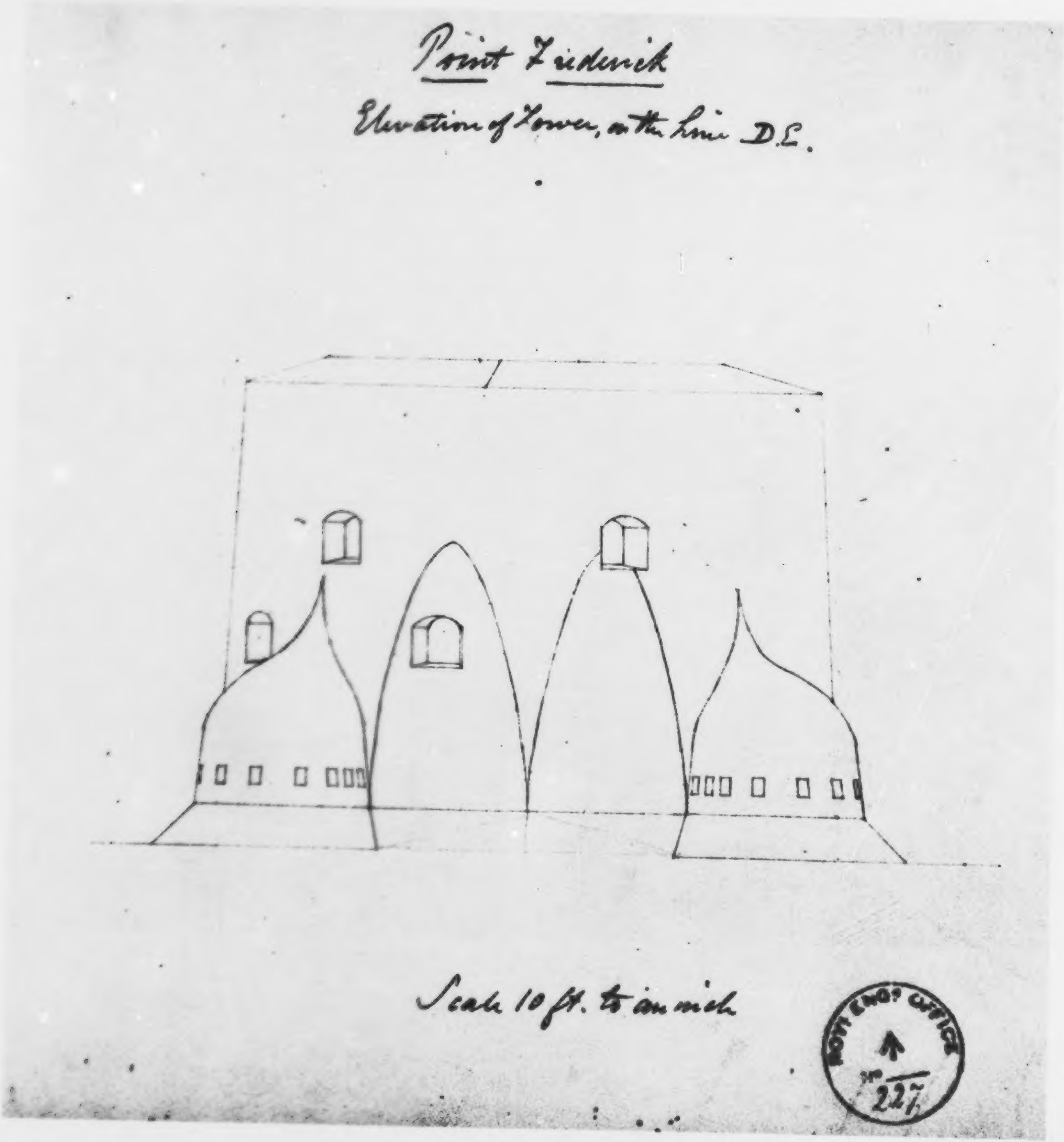

Point Frederick
Plan of upper floor of Tower
Elevation of window from Interior of Tower
Scale 4 feet to the inch for elevation
Scale 10 ft. to an inch
Lieut Royl Engrs
152-32



60 Fort Frederick tower, platform plan, illustrating the relationship of the tower to its caponiers and ditch, 1846.
(Public Archives of Canada.)

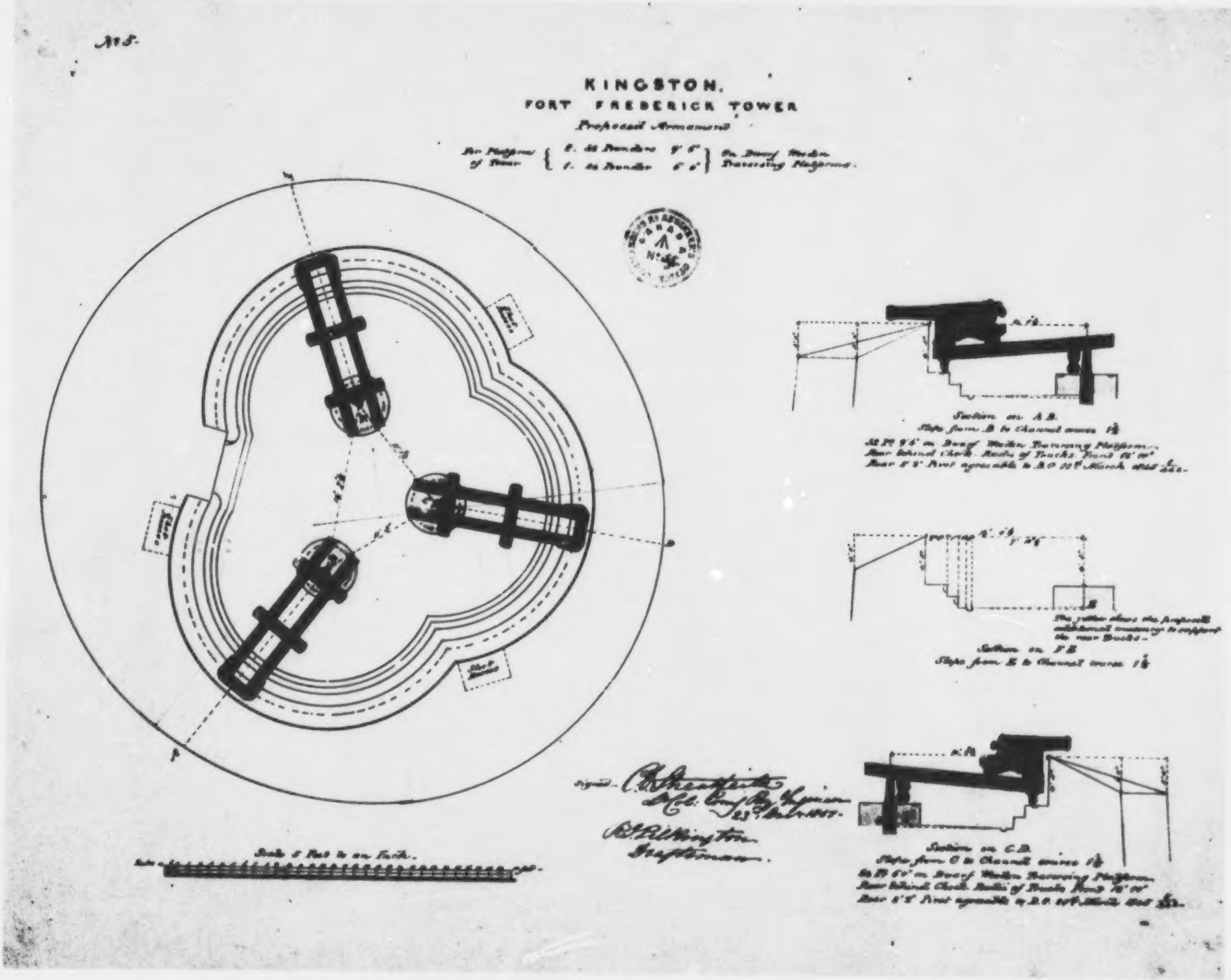
61 Fort Frederick tower, section, 1846.
(Public Archives of Canada.)





62 Fort Frederick tower, elevation, 1846.
(Public Archives of Canada.)

63 Fort Frederick tower, plan and section of the platform, 1851.
(Public Archives of Canada.)

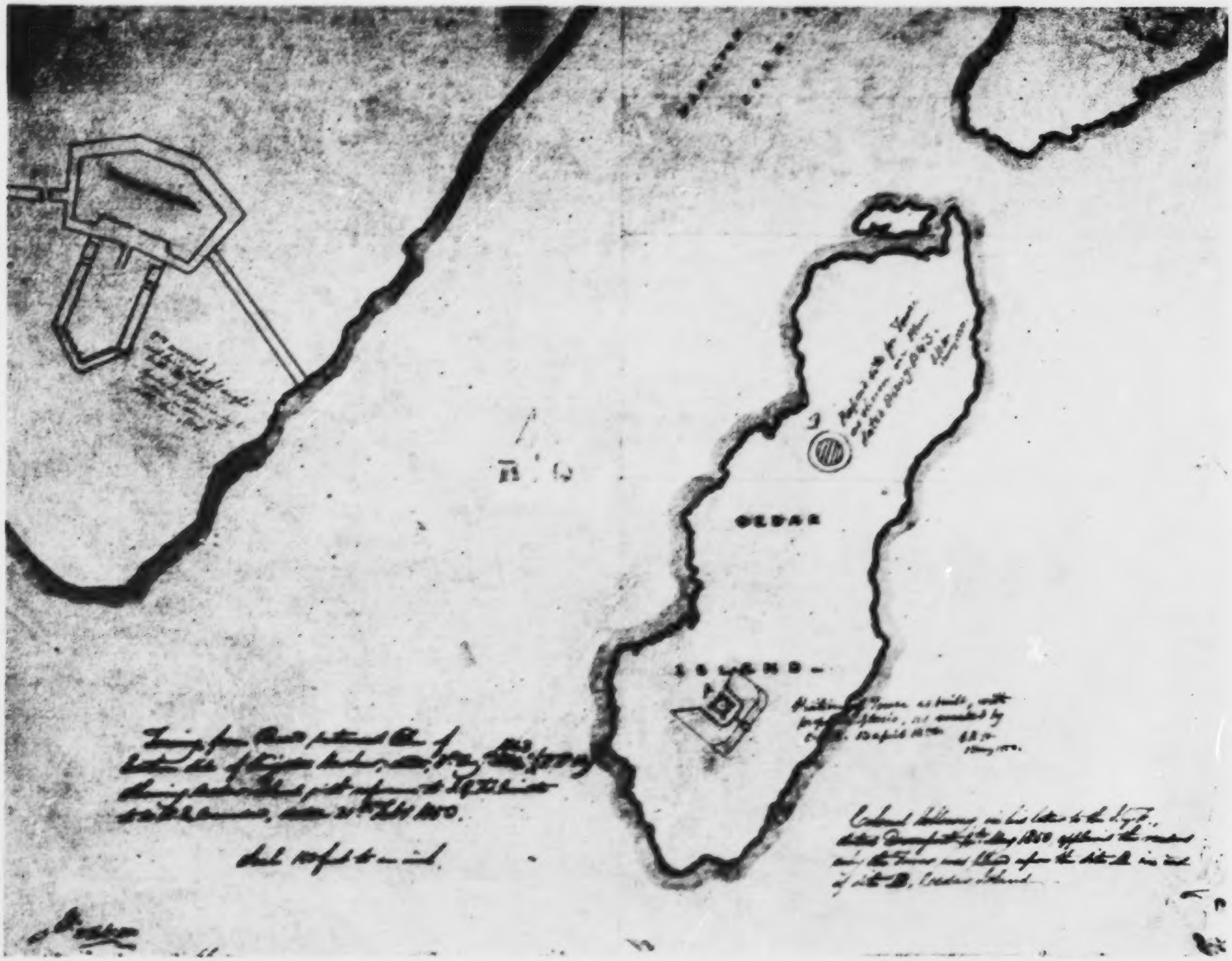


Appendix N. Cedar Island Tower, Kingston

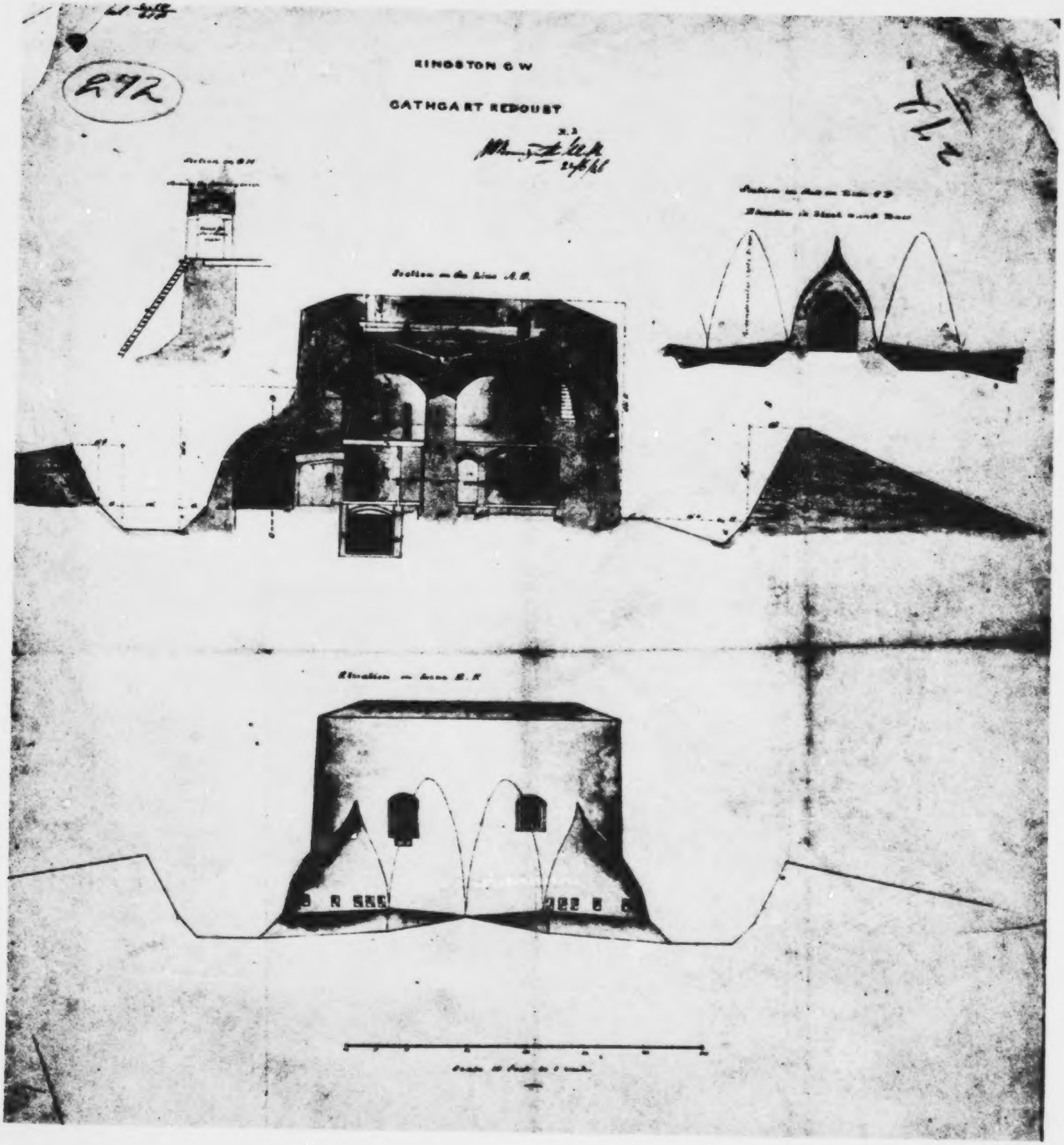
Built: 1846-48
Armed: 1862
Disarmed: date unknown
Demolished: (extant, 1972)
Facing material: limestone ashlar masonry
Diameter: 54 ft.
Height: 36 ft.
Wall thickness: 8 ft. to 14 ft.
Parapet height: 6 ft.
Purpose: to defend the entrance to Hamilton Cove and cooperate in the general defence of Kingston harbour.

64 Cedar Island tower, 1971.
(Photograph by author.)

65 Plan showing the relationship of Fort Henry and Cedar Island, 1850.
(Public Archives of Canada.)

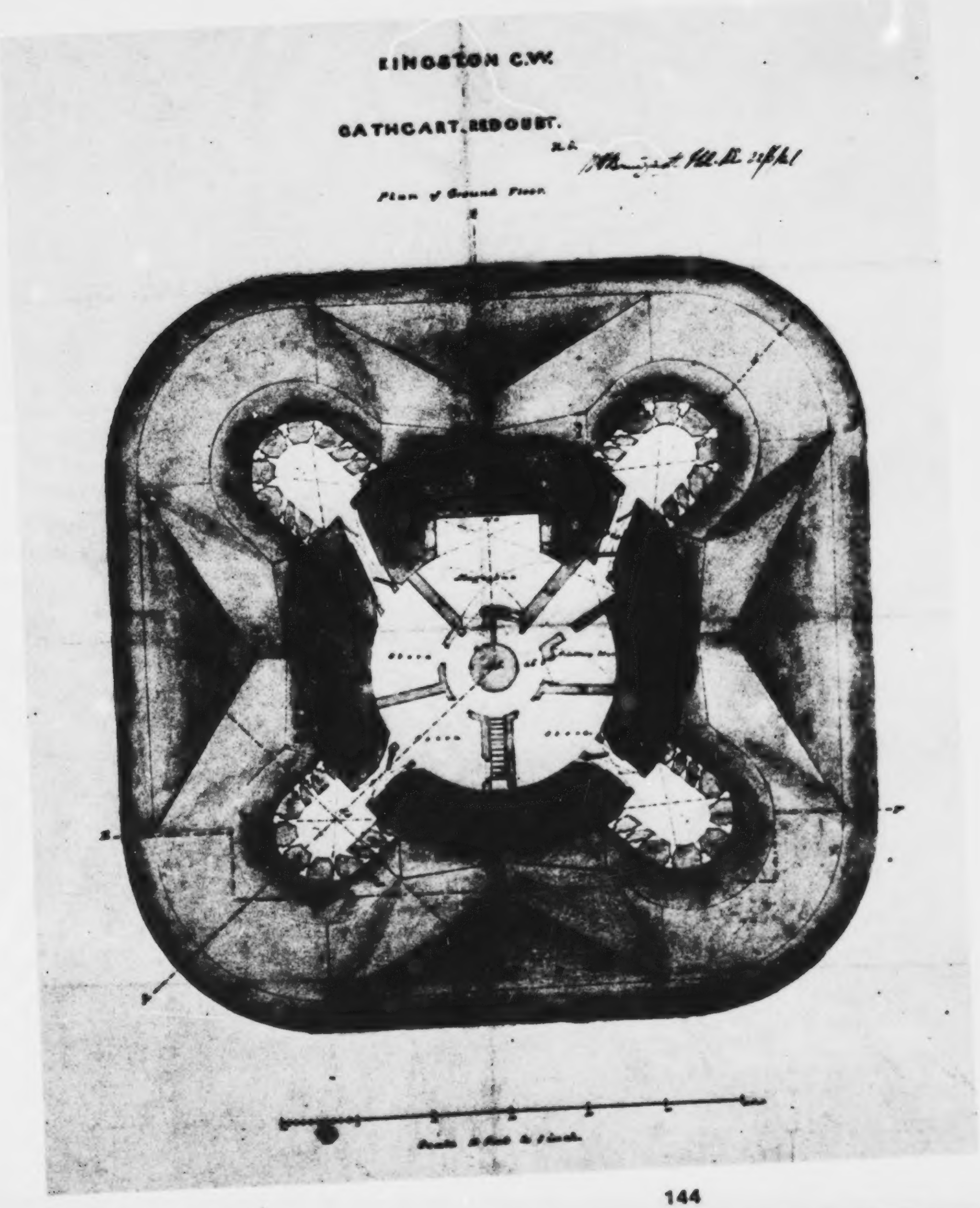


66 Cedar Island tower, section and elevation of the proposed tower, 1846.
(Public Archives of Canada.)

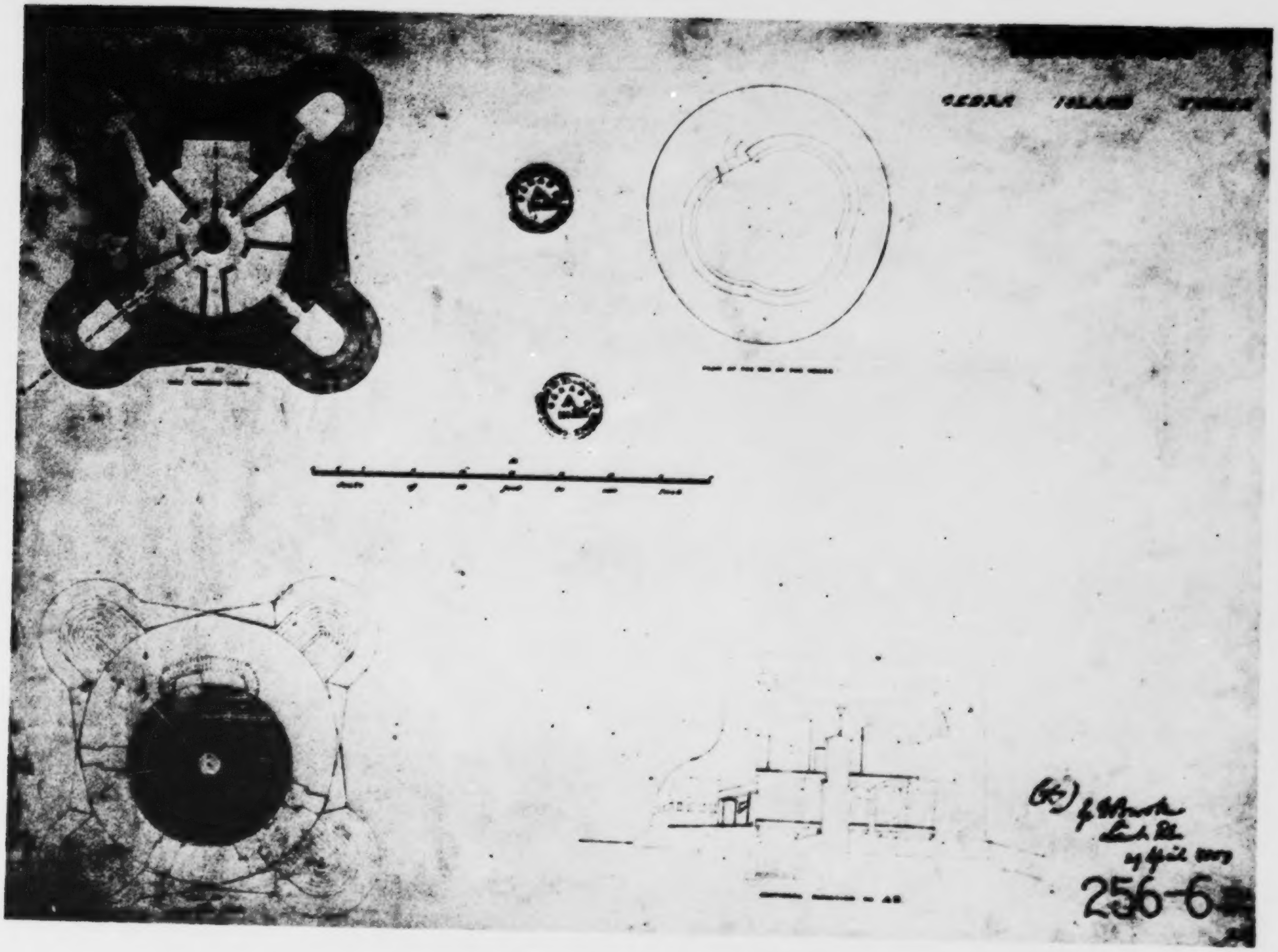


65 Plan showing the relation

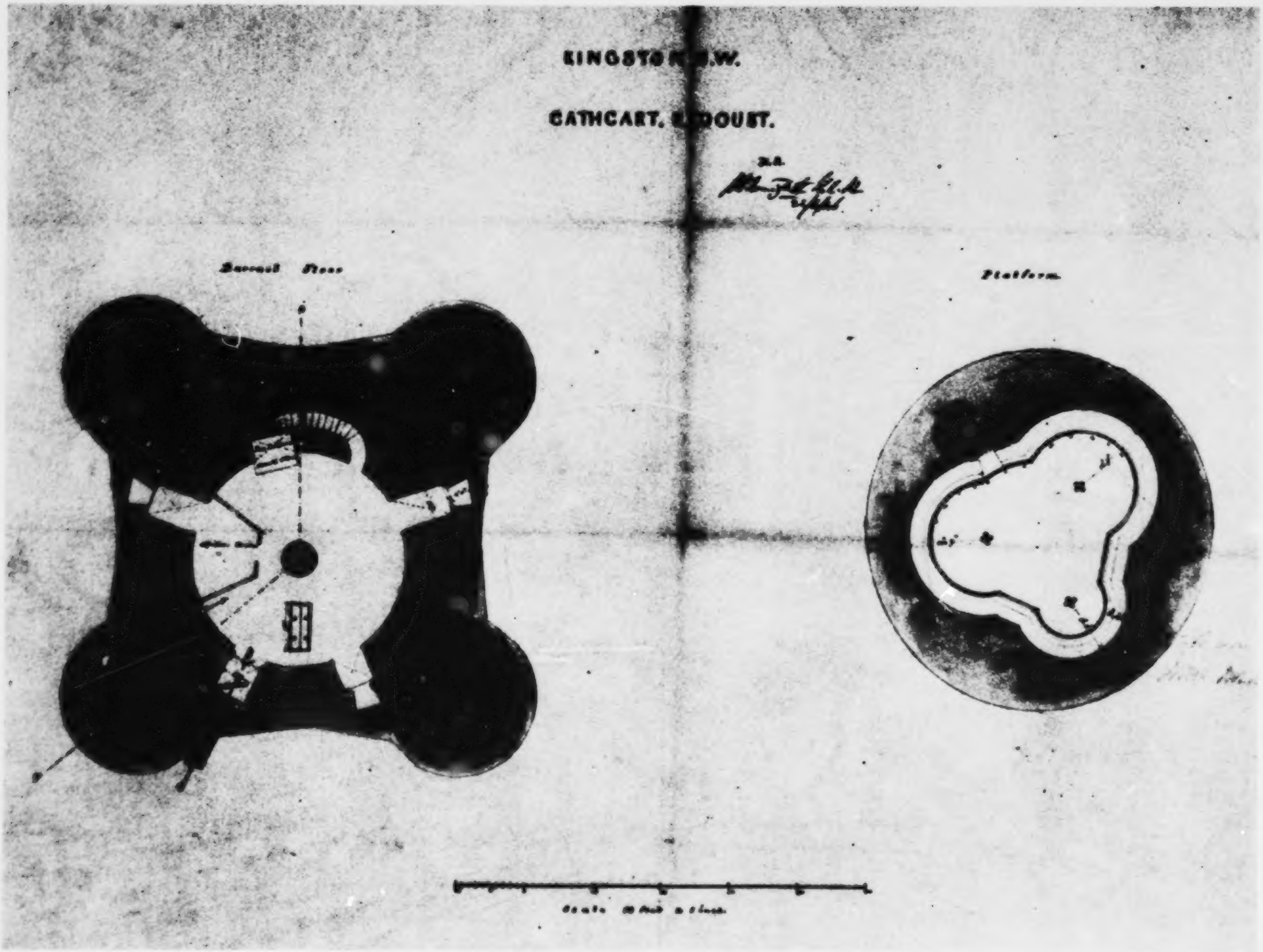
67 Cedar Island tower, basement floor plan, 1846.
(Public Archives of Canada.)



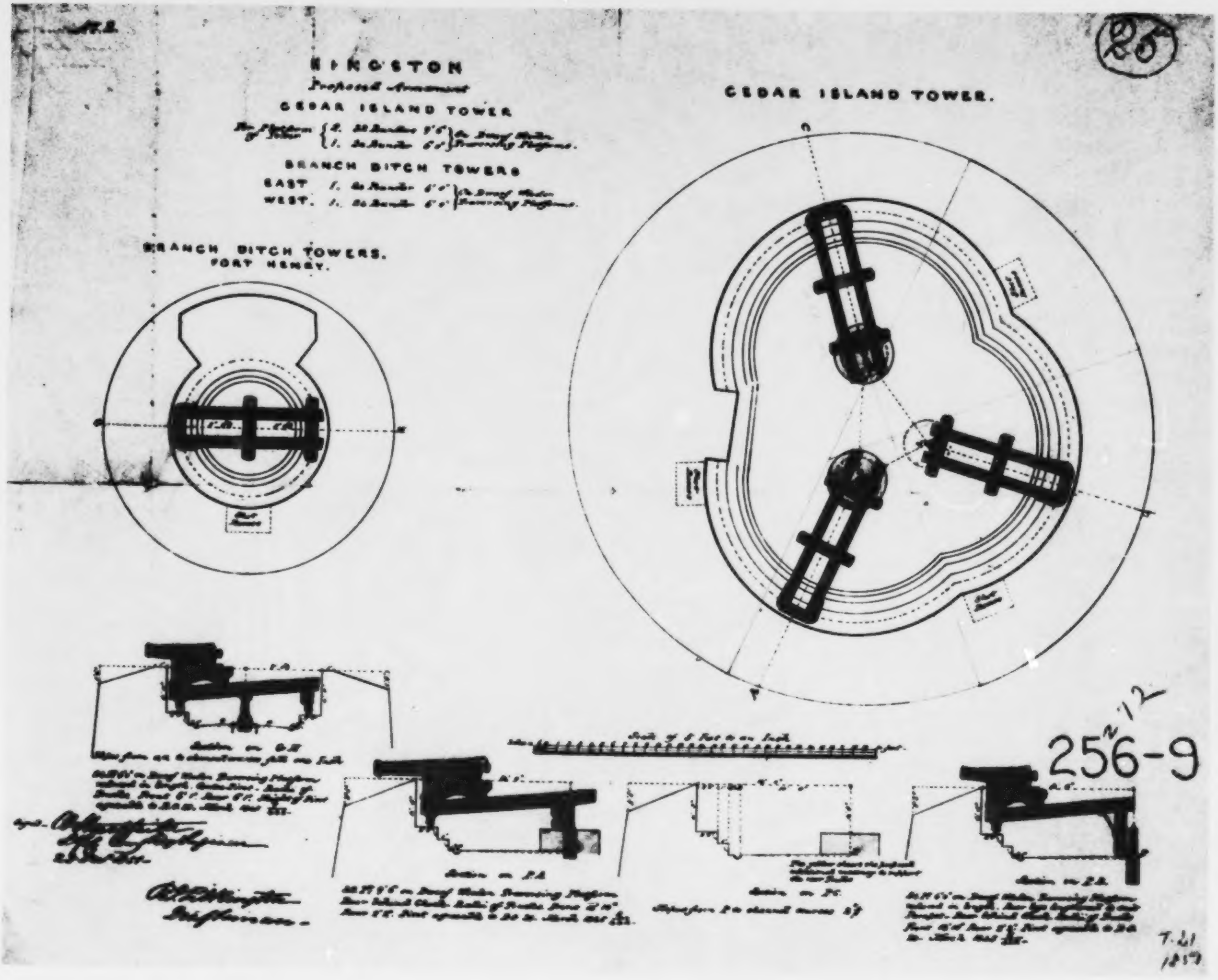
68 Cedar Island tower, section and floor plans, 1859.
(Public Archives of Canada.)



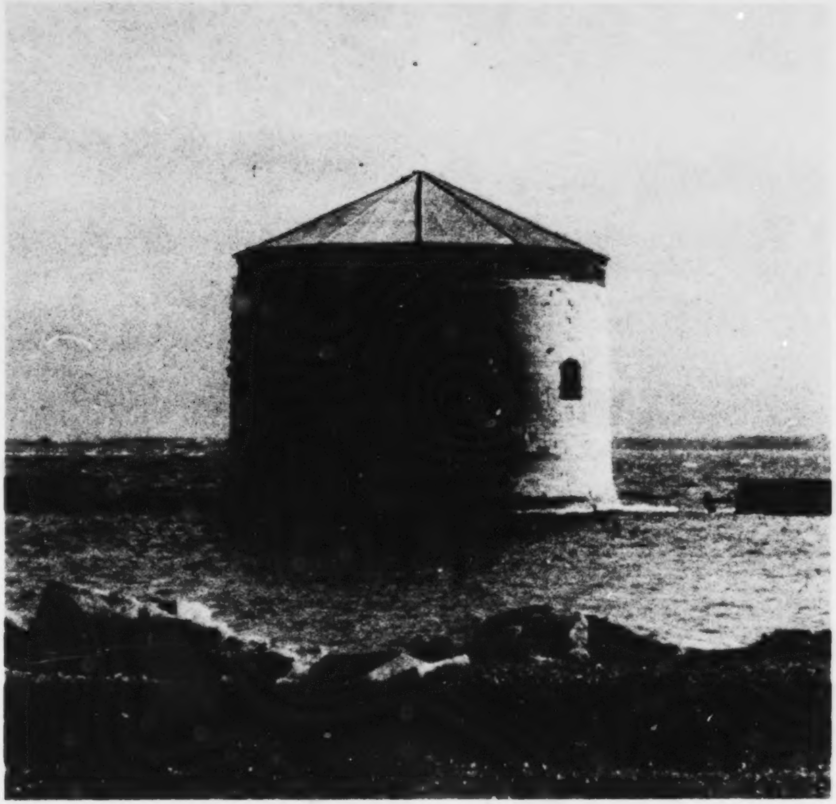
69 Cedar Island tower, barrack floor and platform plans, 1846.
(Public Archives of Canada.)



70 Cedar Island tower, plan and section of the platform showing the proposed method of arming it, 1851.
(Public Archives of Canada.)



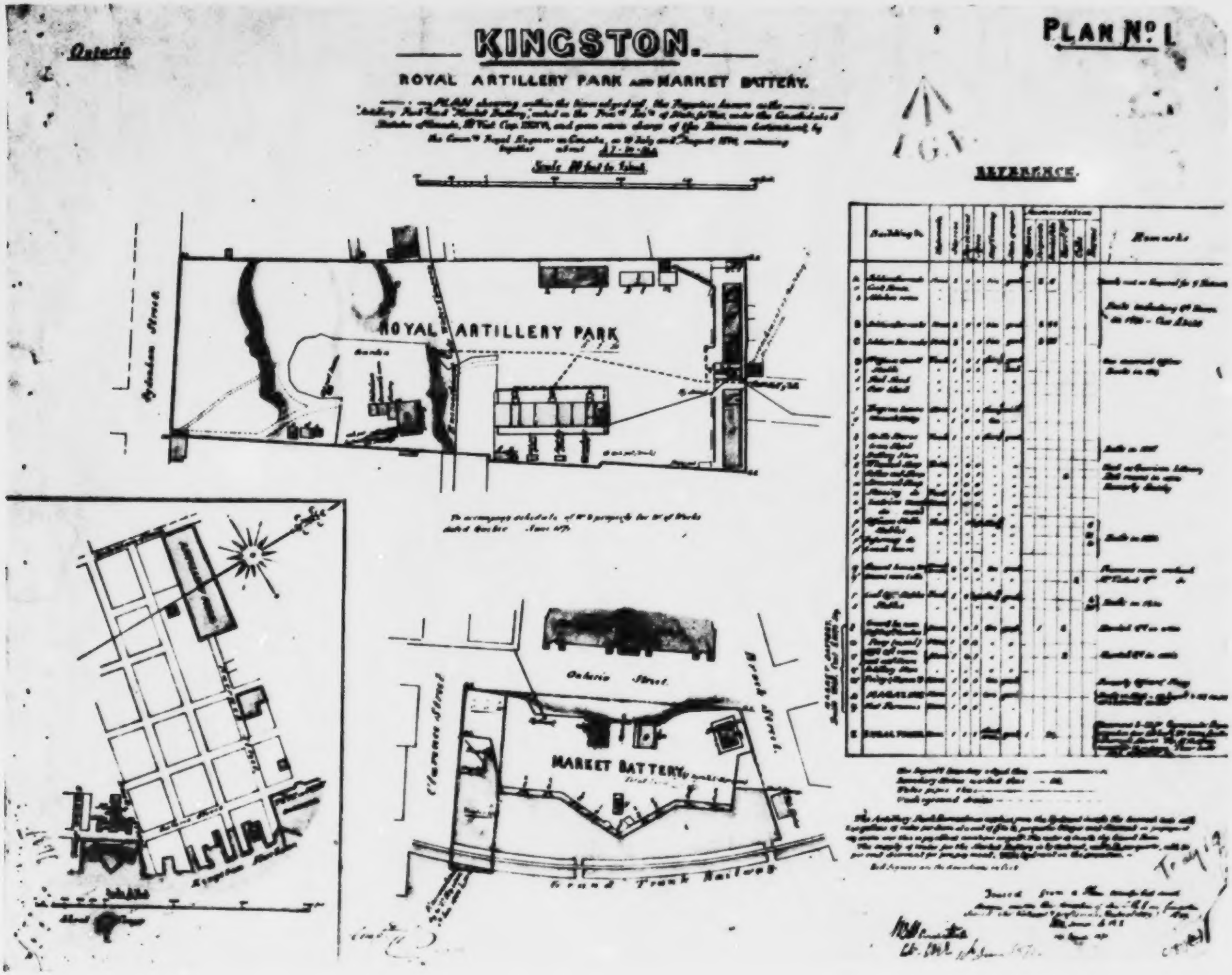
71 Shoal Tower, 1971.
(Photograph by author.)



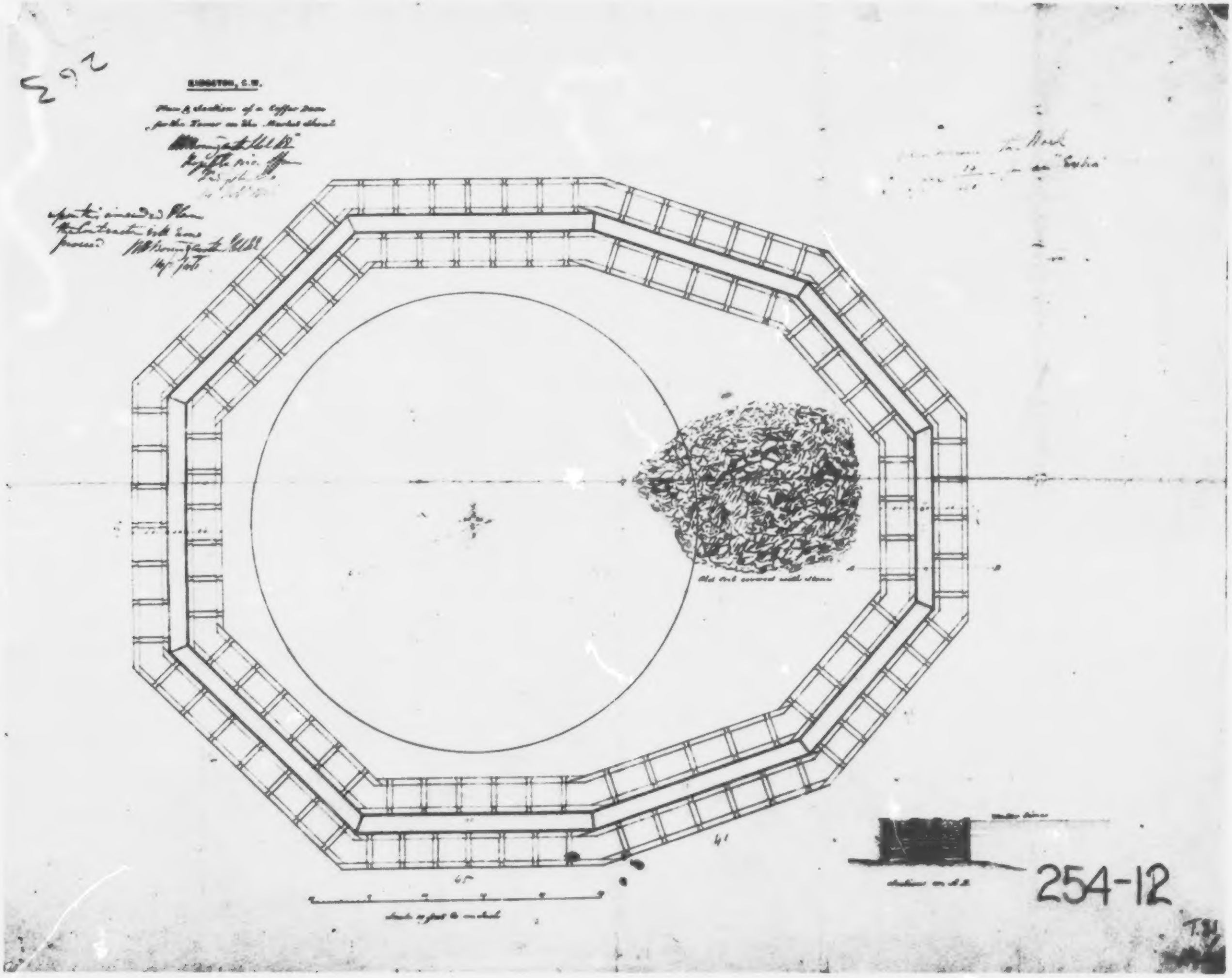
Appendix O. Shoal Tower, Kingston

Built: 1846-47
Armed: 1862
Disarmed: date unknown
Demolished: (extant, 1972)
Facing material: limestone ashlar masonry
Diameter: 65 ft.
Height: 35 ft. from the high water line
Wall thickness: 9 ft. to 14 ft.
Parapet height: approximately 6 ft.
Storeys: two
Purpose: to defend Kingston harbour and the approach to the Rideau Canal.

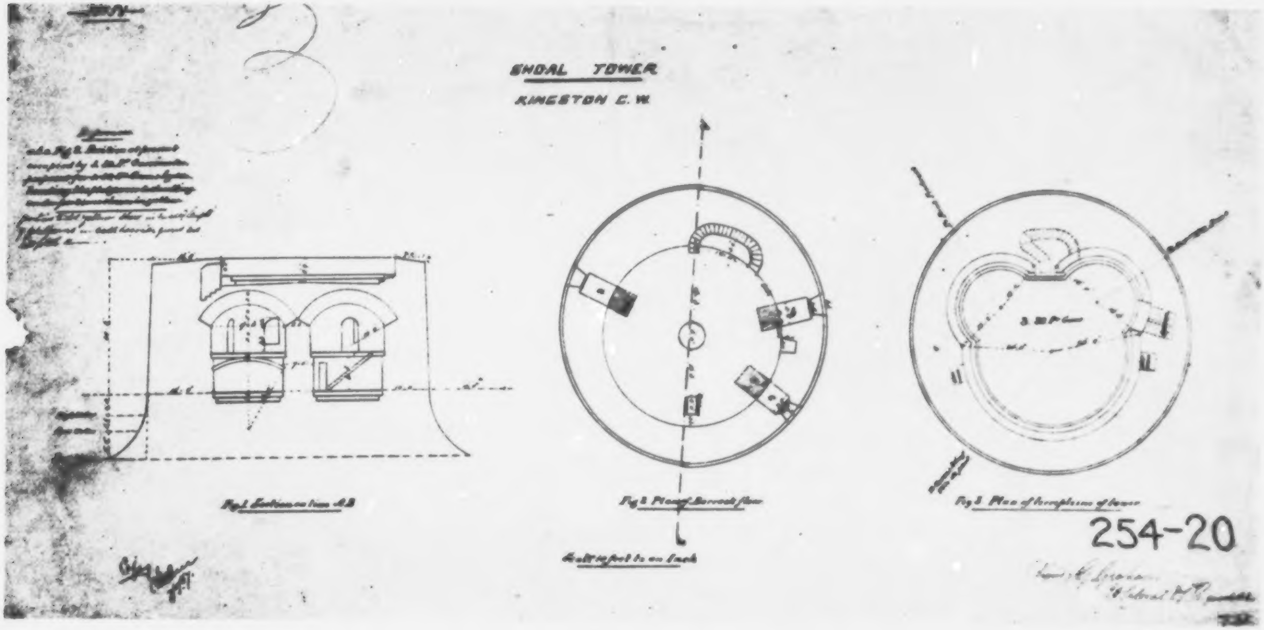
72 Ground plan showing the relationship between the Market House Battery and Shoal Tower, 1870. *(Public Archives of Canada.)*



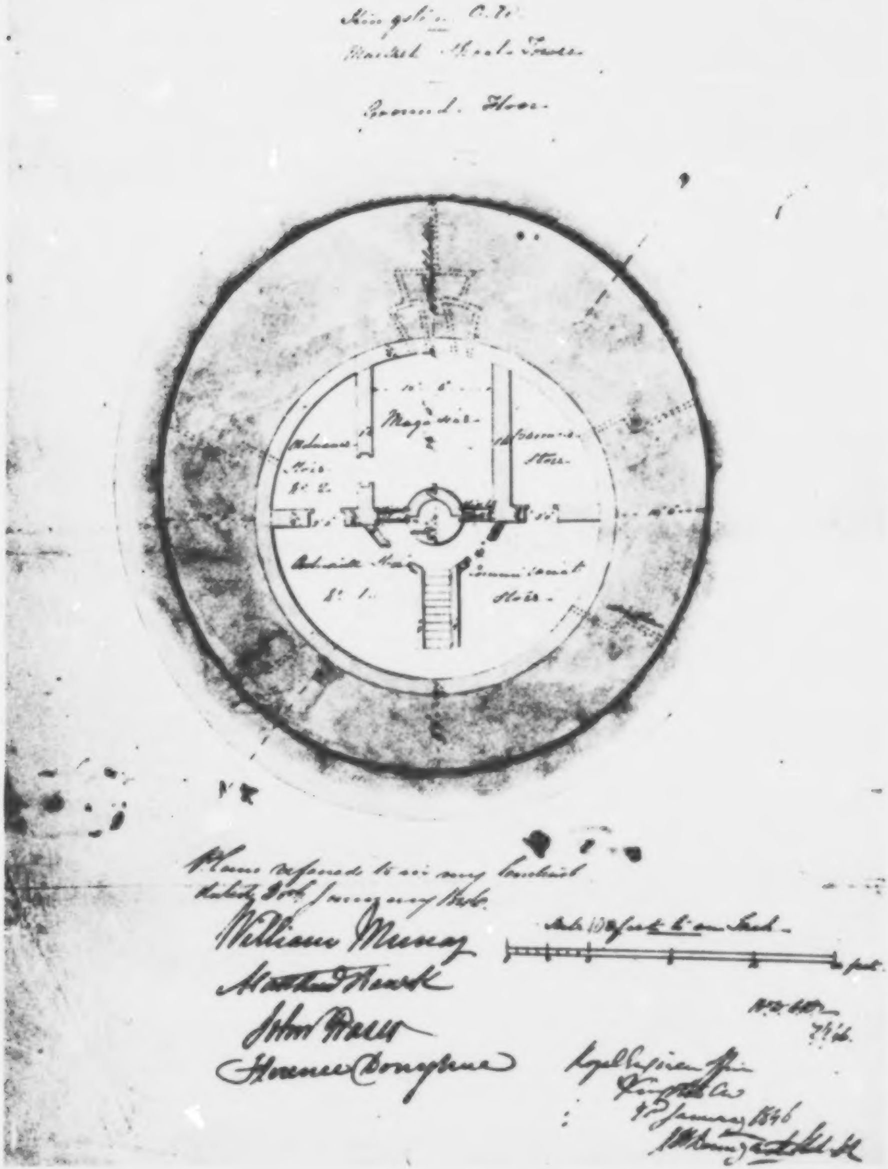
73 Plan and section of the wooden coffer-dam erected on the Market Shoal to facilitate the construction of Shoal Tower, 1846.
(Public Archives of Canada.)


KINGSTON, C.W.
Plan & Section of a Coffer Dam for the Tower on the Market Shoal
Old rock covered with stone
45
41
254-12

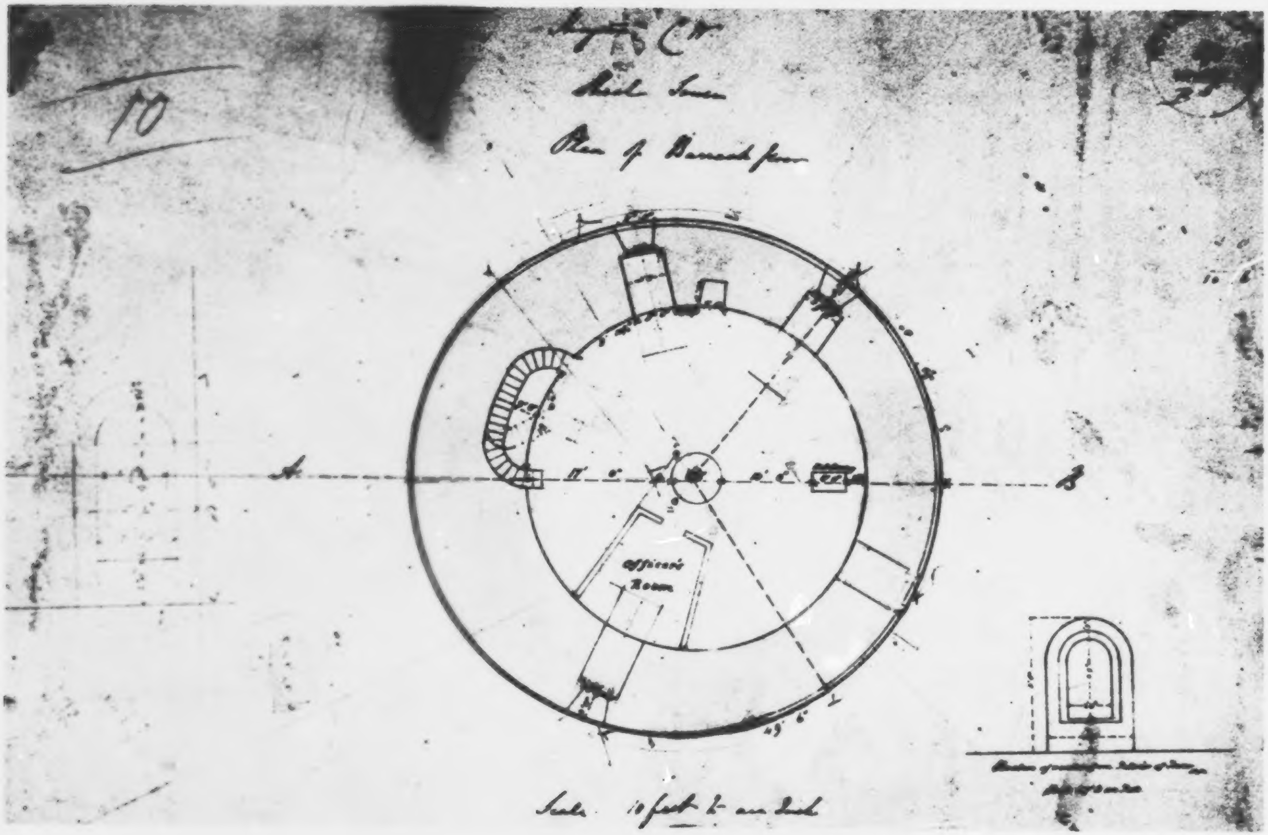
74 Shoal Tower, section and barrack floor and platform plans, 1867.
(Public Archives of Canada.)



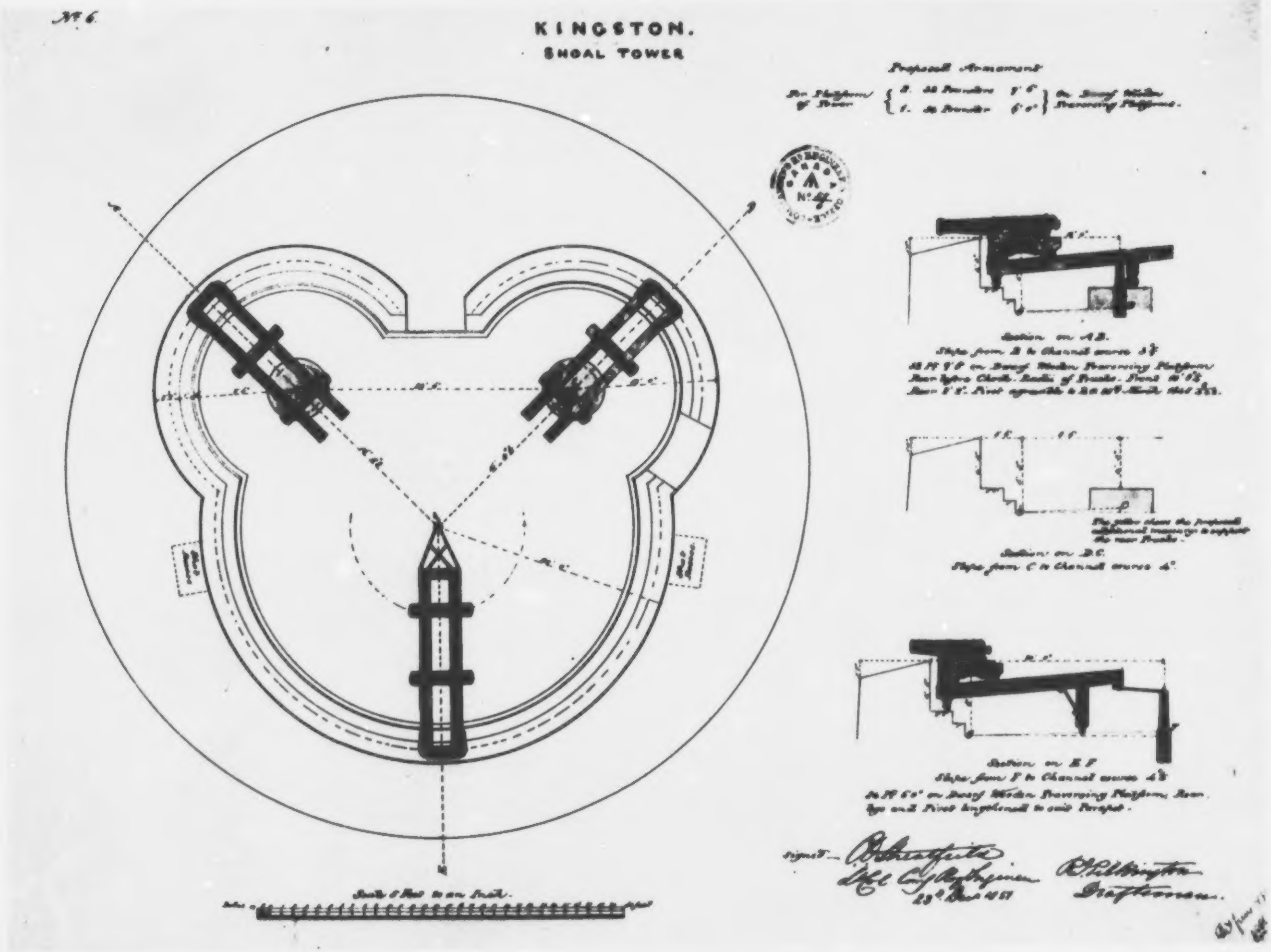
75 Shoal Tower, basement floor plan, 1846.
(Public Archives of Canada.)



76 Shoal Tower, barrack floor plan, 1846.
(Public Archives of Canada.)



77 Shoal Tower, plan and section of the platform showing the intended method of mounting the armament, 1851.
(Public Archives of Canada.)



Endnotes

Historical Background

1 S. P. G. Ward, "Defence Works in Britain, 1803-1805," *Journal of the Society for Army Historical Research*, Vol. 27 (1947), p. 34. Much of the British background to Martello towers in this chapter is drawn from the above source.

2 Charles William Pasley, *A Course in Elementary Fortification* (London, 1822), pp. 472-5.

3 S. P. G. Ward, op. cit., pp. 28, 35.

4 Bryan Hugh St. John O'Neil, *Castles and Cannon: A Study of Early Artillery Fortifications in England* (Oxford: Clarendon Press, 1960), pp. 49, 58.

5 S. P. G. Ward, op. cit., pp. 27-8.

6 Ibid., pp. 27-30; John Holland Rose and Alexander Mayrick Broadley, *Dumouriez and the Defence of England* (London: J. Lane, 1908), p. 234.

7 S. P. G. Ward, op. cit., p. 27.

8 J. H. Rose and A. M. Broadley, op. cit., p. 234.

9 Canada. Public Archives (hereafter cited as PAC), Nova Scotia A, Vol. 123, pp. 180-91, Edward to Portland, 15 Aug. 1796; PAC, RG8, C Series, Vol. 1427, p. 75, Straton to Cornwallis, 14 Aug. 1796.

10 C. W. Pasley, op. cit., p. 473.

11 Ibid., p. 482.

12 S. P. G. Ward, "Defence Works in Britain, 1803-1805," *Journal of the Society for Army Historical Research*, Vol. 27 (1947), pp. 28, 35-6.

13 Ibid., p. 36.

14 Ibid., pp. 27-8.

15 Ibid., p. 29.

16 The Horse Guards had the direction of the military chain of command. Its responsibilities included the Quartermaster's Department and the strictly military officers. It was controlled by the ministry of the Secretary of State for War. The Board of Ordnance was a separate department of state. The Master General of the Board of Ordnance had direct control of the engineers and artillery through their respective inspector generals. It was generally recognized that emergency fieldworks were the prerogative of the Quartermaster's Department while fortifications of a permanent nature were a responsibility of the Board of Ordnance. As the Ordnance was charged with the maintenance as well as the construction of these works it had recourse to an annual parliamentary vote for its funds. The Quartermaster's Department had no regular access to monies and was forced to request fixed sums for specific purposes from the treasury in each case. This division was carried over to colonial service. There, however, the demand was not generally made on the treasury in the first instance but was drawn from the contingency fund available to the commander of the forces. He would then seek recompense from the treasury for the expenditures. The separate and distinct ordnance entity within the army as a whole was maintained into the 1850s, with engineer officers holding rank jointly in the army and their own corps.

17 S. P. G. Ward, op. cit., p. 29, J. H. Rose and A. M. Broadley, op. cit., p. 234.

18 S. P. G. Ward, op. cit., p. 28.

19 Ibid., p. 30 quoting PAC, WO1, Vol. 783, pp. 297-9, Report, dated Inspector-General's Office, 29 April 1804.

20 C. W. Pasley, op. cit., pp. 480-1; S. P. G. Ward, op. cit., pp. 30-1.

21 W. H. Lapthorne, "Martello Towers," *In Britain*, Vol. 22, No. 8 (August 1967), pp. 33-5.

22 S. P. G. Ward, op. cit., pp. 32-3.

23 S. P. G. Ward, op. cit., pp. 32-3, 37; W. H. Lapthorne, op. cit., p. 34.

24 PAC, WO1, Vol. 553, p. 653, Murray to Stanley, 28 July 1845.

25 Colonel Lewis, R. E., "Report on the Application of Forts, Towers, and Batteries to Coast Defences, and Harbours," *Professional Papers of the Royal Engineers*, Vol. 7 (1844), pp. 1-8, and following plates.

26 S. P. G. Ward, op. cit., p. 37, quoting PAC, WO80, Vol. 8, Wellington to Murray, 6 Nov. 1845.

27 General Sir John Burgoyne, "Memorandum of the Increased power of Breaching to be obtained by the Use of Rifled Ordnance," *Professional Papers of the Royal Engineers*, n.s., Vol. 10 (1861), pp. 1-7.

28 C. W. Pasley, op. cit., p. 431; S. P. G. Ward, op. cit., p. 31; Nova Scotia. Public Archives (hereafter cited as PANS), view, plan, and section of Sherbrooke Tower as completed in 1828.

29 S. P. G. Ward, op. cit., p. 32 and p. 33, n. 283. Evidence of the composition of the Canadian towers has been derived from a close examination of many plans and reports relating to the structural materials of the towers.

30 C. W. Pasley, op. cit., p. 476.

31 S. P. G. Ward, op. cit., p. 31; C. W. Pasley, op. cit., p. 476.

32 C. W. Pasley, op. cit., pp. 481-2.

33 Great Britain. Army. Corps of Royal Engineers, "Note on the Coast Defence Towers approved by Napoleon," *Professional Papers of the Royal Engineers*, Vol. 3 (1839), pp. 101-9.

34 S. P. G. Ward, op. cit., p. 37.

The Era of Great Construction: 1796-1815

1 Robert Morse, "Report on Nova Scotia, 1784," *Report on Canadian Archives* (Ottawa: Queen's Printer, 1885), pp. xliii-xlvi.

2 PAC, MG11, CO217, Vol. 77, pp. 225-39, Sargent to Sullivan, 30 Nov. 1802.

3 PAC, Nova Scotia A, Vol. 121, pp. 298-324, Edward to Dundas, 11 Nov. 1794; ibid., Vol. 124, pp. 138-49, Edward to Portland, 29 Oct. 1796.

4 PAC, RG8, C Series, Vol. 1427, p. 75, Straton to Cornwallis, 14 Aug. 1796. PAC, Nova Scotia A, Vol. 124, pp. 156-61, Portland to Edward, 31 Oct. 1796; PANS, RE B, Straton to Edward, 3 Sept. 1796; PAC, Nova Scotia A, Vol. 126, pp. 5-15, Edward to Portland, 12 Aug. 1797; PAC, RG8, C Series, Vol. 1427, p. 144, Straton to Crew, 18 Nov. 1797; PANS, RE B, p. 163, Straton to Edward, 30 Aug. 1898.

5 PAC, Nova Scotia A, Vol. 121, pp. 298-324, Edward to Dundas, 11 Nov. 1794.

6 Ibid., Vol. 123, pp. 180-91, Edward to Portland, 15 Aug. 1796.

7 PAC, RG8, C Series, Vol. 1427, pp. 61-2, Straton to Green, 20 July 1796.

8 PAC, Nova Scotia A, Vol. 125, pp. 48-65, Edward to Portland, 16 Feb. 1797.

9 Ibid., Vol. 124, pp. 156-61, Portland to Edward, 1 Nov. 1796, (enclosure) Crew to King, 31 Oct. 1796; ibid. Vol. 126, pp. 5-15, Edward to Portland, 12 Aug. 1797.

10 Ibid., Vol. 126, Prince of Wales Tower estimate, 1797; PAC, RG8, C Series, Vol. 1427, p. 144, Straton to Crew, 18 Nov. 1797; PAC, Nova Scotia A, Vol. 126, Prince of Wales Tower estimate, 1797; PAC, MG12, WO55, Vol. 857, p. 15, Edward to Cornwallis, 16 Dec. 1797; PANS, RE B, p. 163, Straton to Edward, 30 Aug. 1798.

11 PAC, Prince of Wales Tower, 1812, plans and section; PAC, MG12, WO55, Vol. 857, p. A1, Fenwick to Crew, 6 May 1803; George Munroe, "The Prince of Wales Tower, Halifax, N.S.," Manuscript on file, National Historic Parks and Sites Branch, Ottawa, Vol. 1, p. 3.

12 PAC, MG12, WO55, Vol. 858, p. 564, 1 Aug. 1805, Fenwick's report on the Halifax defences; PANS, RE5, p. 68, MacLauchlan to Bruyeres, 18 April 1808.

13 PAC, RG8, C Series, Vol. 1427, pp. 189-90, Fenwick to Straton, 3 April 1800; PAC, Prince of Wales Tower, 1812, plans and section; PAC, MG12, WO55, Vol. 858, abstract to Prince of Wales Tower expenses, 1805-06, dated 30 June 1806; PAC, MG12, WO44, Vol. 144, p. 136, Report on the Halifax defences, 1 July 1810.

14 PAC, Prince of Wales Tower, 1812, plans and section.

15 PAC, Nova Scotia A, Vol. 126, Prince of Wales Tower estimate, 1797; PAC, RG8, C Series, Vol. 1432, Reynett to Fenwick, 26 April 1805.

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17 PAC, MG11, CO217, Vol. 78, p. 18, Bowyer to Hobart, 8 Nov. 1802; PAC, MG12, WO44, Vol. 147, p. 165, Report on the Nova Scotia Ordnance Establishment, 30 Sept. 1808; ibid., Vol. 144, p. 136, Report on the Halifax Works, 1 July 1810; ibid., Vol. 80, p. 348, Return of Forts and Batteries in Nova Scotia, 1 July 1812; PANS, RE52, Return of Forts and Batteries in the Nova Scotia Command, 1 Jan. 1813.

18 PAC, RG8, C Series, Vol. 1428, p. 209, Fenwick to Bowyer, 25 June 1805; PAC, MG12, WO44, Vol. 144, p. 136, Report on the Halifax Works, 1 July 1810; PAC, RG8, C Series, Vol. 1706, pp. 24-5, James to Prevost, 1 May 1811; PAC, MG12, WO44, Vol. 95, p. 240, Report on Forts and Batteries in Nova Scotia and New Brunswick, 1 Jan. 1817; ibid., Vol. 144, p. 136, Report on the Halifax Works, 1 July 1810.

19 Ibid., Vol. 80, p. 348, Return of Forts and Batteries in Nova Scotia, 1 July 1812.

20 PANS, RE23, Colonel Jervois' Minute, 29 July 1856, with regard to Halifax defences; Harry Piers, *The Evolution of the Halifax Fortress: 1749-1928*, rev. ed. (Halifax, N.S.: PANS, 1947), p. 103; Robert Morse, op. cit., p. xliv; PAC, Nova Scotia A, Vol. 124, pp. 138-49, Edward to Portland, 29 Oct. 1796; PAC, MG12, WO55, Vol. 857, p. 27, Straton to Edward, 17 April 1798; ibid., Vol. 857, p. 191, Fenwick to Crew, 6 May 1803.

21 Ibid., Vol. 858, p. 569, Fenwick's report on the Halifax defences, 1 Aug. 1805; PAC, Fort Clarence and Tower, 1853, plan; PAC, RG8, C Series, Vol. 1825, Willis to Commanding Royal Engineer, 7 July 1849; PAC, Fort Clarence and Tower, 1853, plan; PAC, MG11, CO217, Vol. 80, pp. 304, Fenwick to Gardiner, 1 Aug. 1805; PAC, RG8, C Series, Vol. 1825, pp. 371-4, Willis to Commanding Royal Engineer, 7 July 1849.

22 Ibid.; PAC, Fort Clarence and Tower, 1853, plan; PAC, MG11, CO217, Vol. 80, pp. 304-10, Fenwick to Gardiner, 1 Aug. 1805.

23 PAC, MG12, WO55, Vol. 857, p. 191, Fenwick to Crew, 6 May 1803.

24 PANS, RE52, Semi-annual report on Maritime Forts and Batteries, 1 Jan. 1813; PAC, RG8, C Series, Vol. 1825, pp. 371-4, Willis to Commanding Royal Engineer, 7 July 1849; PAC, MG12, WO44, Vol. 80, p. 348, Return of Nova Scotia Forts and Batteries, 1 July 1812; PAC, RG8, C Series, Vol. 1706, p. 135, Nicolls to Morse, 10 April 1811; PAC, MG12, WO55, Vol. 859, Halifax repair estimate, 18 April 1811; PANS, RE53, Semi-annual report on Maritime Forts and Batteries, 1 Jan. 1813; PAC, MG12, WO44, Vol. 81, p. 108, Royal Engineer Department expenses, 1 Oct. 1811-30, Sept. 1812; PAC, Fort Clarence and tower, 1853, plan; PAC, RG8, C Series, Vol. 1825, pp. 371-4, Willis to Commanding Royal Engineer, 7 July 1849; PAC, MG12, WO44, Vol. 81, p. 108, Royal Engineer Department Expenses, 1 Oct. 1811-30 Sept. 1812; PANS, RE52, report on Maritime Forts and Batteries, 1 Jan. 1813.

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26 PAC, RG8, C Series, Vol. 1825, pp. 371-4, Willis to Commanding Royal Engineer, 7 July 1849; PAC, WO44, Vol. 84, p. 201, Meredith to the Master General of the Board of Ordnance, 21 March 1808; ibid., Vol. 95, p. 240, Report on the Forts and Batteries in Nova Scotia and New Brunswick, 1 Jan. 1817.

27 PANS, RE52, Report on Maritime Forts and Batteries, 1 July 1812; PAC, MG12, WO44, Vol. 80, p. 348, Nicolls' return of Nova Scotia forts and batteries, 1 July 1812.

28 PAC, Nova Scotia A, Vol. 121, Edward to Dundas, 11 Nov. 1794; ibid., Vol. 124, pp. 138-49, Edward to Portland, 29 Oct. 1796; Harry Piers, op. cit., p. 105; PAC, MG12, WO44, Vol. 148, p. 138, estimate for a new York Redoubt Tower roof, 20 Oct. 1823; ibid., Vol. 174, 1849 plan of top of York Redoubt Tower; PAC, MG11, CO217, Vol. 80, pp. 304-10, Fenwick to Gardiner, 1 Aug. 1805.

29 Ibid.

30 PAC, MG12, WO44, Vol. 148, p. 138, estimate for a new York Redoubt Tower roof, 20 Oct. 1823; PAC, MG11, CO217, Vol. 80, pp. 304-10, Fenwick to Gardiner, 1 August 1805; PAC, MG12, WO44, Vol. 84, p. 201, Meredith to the Master General of the Board of Ordnance, 21 March 1808; PANS, ground plan of York Redoubt, n.d.; ibid., Vol. 174, 1849 plan of top of York Redoubt Tower.

31 PAC, MG12, WO55, Vol. 859, p. 390, Nicolls' estimate for a York Redoubt Tower Magazine, 18 April 1811; PAC, MG11, CO217, Vol. 80, pp. 304-10, Fenwick to Gardiner, 1 Aug. 1805; PANS, RE5, p. 37, MacLauchlan to Morse, 8 Oct. 1807; PAC, MG12, WO44, Vol. 144, p. 136, report on the Halifax Works, 1 July 1810.

32 Ibid., Vol. 84, p. 201, report on Halifax Forts and Batteries, 21 March 1808; ibid., Vol. 144, p. 136, Report on the Halifax works, 1 July 1810; ibid., Vol. 95, p. 240, Report on Forts and Batteries in Nova Scotia and New Brunswick, 1 Jan. 1817; ibid., Vol. 80, p. 348, Nicolls' report on Nova Scotia forts and batteries, 1 July 1812.

33 PAC, Nova Scotia A, Vol. 132, pp. 140-6, Wentworth to King, 29 Aug. 1800; PAC, MG12, WO44, Vol. 84, p. 14, Report on Halifax tower defences, 1 July 1814; PAC, MG11, CO217, Vol. 80, p. 301, Gardiner to Gordon, 16 Sept. 1805; PANS, RE52, Semi-Annual Report on Maritime defences, 1 July 1812; PAC, MG11, CO217, Vol. 78, p. 19, Fenwick's report on the state of the Halifax works, 6 May 1803.

34 PAC, RG8, C Series, Vol. 1427, p. 256, Fenwick to Morse, 25 Nov. 1801; P.R.O., MPH/489, Estimate for a tower on Georges Island, 18 Jan. 1800, and plan, section, and elevation of a proposed Citadel Hill work, 20 Jan. 1800.

35 PANS, RE5, p. 57, MacLauchlan to Morse, 2 March 1808; PAC, MG11, CO217, Vol. 83, pp. 3-8, Prevost to Castlereagh, 25 May 1808.

36 Ibid., Vol. 82, pp. 122-5, Hunter to Cooke, 27 March 1808.

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38 PAC, MG11, CO217, Vol. 83, pp. 3-8, Prevost to Castlereagh, 28 May 1808, Enclosure, Nicolls to Prevost, 25 May 1808.

39 PAC, RG8, Series II, Vol. 9, Mann to Hunter, 1 August 1804.

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42 Ibid., Vol. 857, p. 427, Chatham to Camden, 5 July 1805.

43 PAC, MG11, CO42, Vol. 134, pp. 135-45, Governor Sir James Craig's Instructions, August 1807.

44 John Mackay Hitsman, *Safeguarding Canada: 1763-1871* (Toronto: University of Toronto Press, 1968), p. 75.

45 PAC, MG11, CO42, Vol. 136, pp. 126-34, Craig to Castlereagh, 12 July 1808.

46 Ibid., Vol. 132, pp. 135-45, Governor Sir James Craig's Instructions, August 1807; ibid., Vol. 136, pp. 126-34, Craig to Castlereagh, 12 July 1808.

47 Ibid., Vol. 136, pp. 126-34, Craig to Castlereagh, 12 July 1808.

48 Ibid., Vol. 136, pp. 189-90, Craig to Cooke (private), 15 July 1808.

49 PANS, RE5, p. 68, MacLauchlan to Bruyeres, 18 April 1808; PAC, MG12, WO55, Vol. 859, p. 431, Bruyeres to Morse, 16 Nov. 1810; S. G. P. Ward, "Defence Works in Britain, 1803-1805," *Journal of the Society for Army Historical Research*, Vol. 27 (1947), p. 21.

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Report of the 1972 Archaeological Excavations of the Market Shoal Tower, Kingston, Ontario

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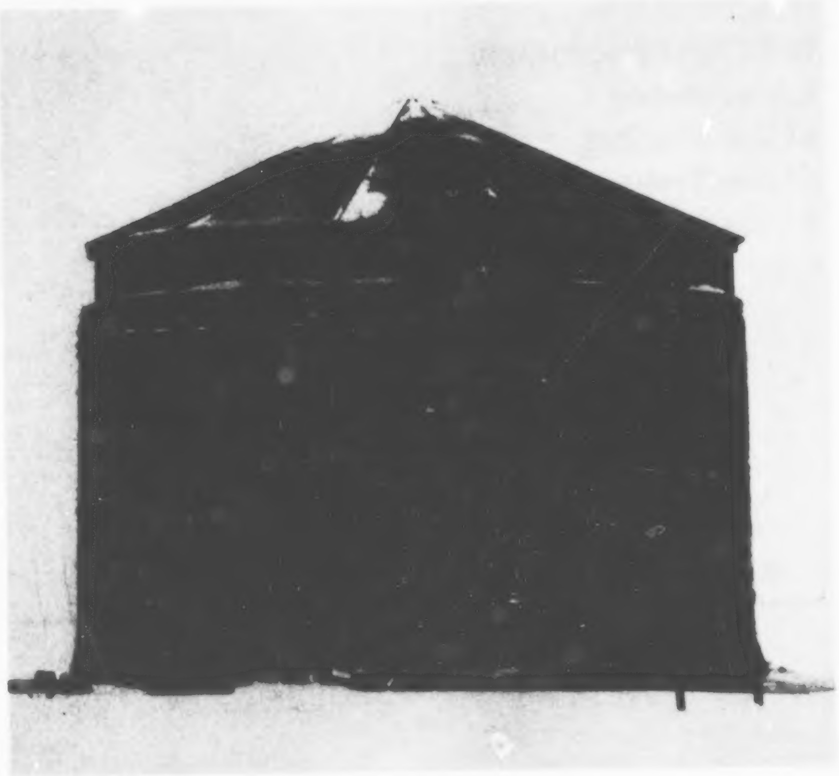
Canadian Historic Sites/
Lieux historiques canadiens
No. 15

172 **Abstract**
173 **Résumé**
174 **Introduction**
176 **Historical Background**
179 **Excavations**
179 The Ground Floor
192 The Second Level
203 The Third Level
204 **Artifacts**
204 Ceramics
205 Pipes
206 Coins
206 Buttons
208 Glass
212 Metal Artifacts
215 Wooden Artifacts
219 Bone Artifacts
220 Leather Artifacts
222 **Conclusions**
223 **References Cited**

1 The Shoal Martello tower from the west, 1971.



Abstract

Archaeological excavations were conducted on the Market Shoal Martello tower during the month of February, 1972. These excavations uncovered the ground floor of the tower and exposed the No. 1 ordnance store, No. 2 ordnance store, the powder magazine, the barracks store and the commissariat. Most of the structural material remaining in these rooms was flooring. Sections of the second level were also excavated including one window, the roof of the powder magazine, the boiler and the vault above the No. 2 ordnance store. A latrine was excavated on the gun platform and a small quantity of mid-19th-century artifacts was collected from the site.

Submitted for publication 1973
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Résumé

Au pied de la rue Brock dans le port de Kingston, entre le quai de l'Etat et le quai Swift, s'élève la tour Martello "Market Shoal"; elle est entourée d'eau d'une profondeur variant de 2 à 9 pieds. Partie des ouvrages défensifs construits par les Anglais pour protéger le port de Kingston et la sortie du canal Rideau, cette tour de pierres calcaires taillées fut bâtie ainsi que trois autres entre 1846 et 1847 pour parer à l'éventualité menaçante d'une attaque américaine durant la campagne présidentielle de 1844. Il n'y eut pas d'attaque et cette tour, comme les autres de la région, ne fut jamais mise à l'épreuve, fort heureusement d'ailleurs, puisque peu après ce genre de tour fut jugé inefficace contre l'artillerie de l'époque.

Une fois passé le moment de panique qui avait entraîné leur construction, les tours furent négligées, sauf pour une courte période des années 1860 lorsque se tendirent à nouveau les relations avec les Etats-Unis. Cet état de choses ne dura pas et la tour qui nous intéresse fut remise aux forces canadiennes en 1870 lorsque l'armée britannique se retira du Canada. Conservée en bon état pendant 10 ans, elle fut ensuite laissée à l'abandon.

En 1972, des fouilles archéologiques furent exécutées dans la tour et des plans détaillés de l'architecture furent dressés. A ce moment-là, la tour était remplie de décombres et des déjections laissées par maintes générations de chauves-souris et de pigeons.

De forme ovale, elle a comme diamètres extérieurs 65 pieds sur 60 pieds et s'élève à 45 pieds au-dessus du haut-fond. La partie sud du mur extérieur est plus épaisse de 5 pieds que le reste du mur pour assurer une plus grande protection à ce côté plus exposé et recevoir un escalier menant à la plate-forme du canon.

La tour possédait trois niveaux, soit une plate-forme de canon en haut, une caserne au milieu et un entrepôt de munitions et de provisions pour la garnison en bas. Les deux planchers de bois s'étaitent complètement effondrés dans l'espace sous le plancher inférieur. L'entrée se situait au deuxième niveau où logeaient les officiers et les soldats de la garnison et où il y avait trois caronades de 32. Un escalier menait au niveau inférieur où se trouvaient la poudrière à voûte de briques, les deux entrepôts de munitions, l'intendance et le magasin aux vivres de la caserne. La plate-forme de canon possédait deux latrines et trois canons de 24 à âme lisse sur petits affûts de pointage en direction. Au moment des fouilles, les canons étaient toujours montés sur leur affût, mais les latrines n'étaient plus utilisables.

Les fouilles du niveau inférieur permirent de dégager d'importantes portions intactes du plancher effondré qui fournirent d'assez bons renseignements sur la technique de construction utilisée. On s'était servi de chêne blanc. Mêlés aux restes du plancher et aux décombres, il y avait de nombreux objets ayant appartenu à la tour, mais peu à ses occupants. Les fouilles permirent de récupérer un assez bon échantillon de pièces de métal ayant servi à la tour et à son artillerie, mais peu d'objets de verre ou de céramique.

La tour "Market Shoal", propriété du gouvernement canadien, relève de Parcs Canada. Les fouilles visaient à recueillir le plus d'informations possibles sur cet ouvrage défensif puisque cette tour est la seule des quatre tours de Kingston dont l'intérieur n'a été altéré que par le temps. A cet égard, les fouilles de 1972 furent un succès.

Introduction

The Market Shoal tower is located 100 yd. offshore in Kingston Harbour at 76°28′43″W. latitude, longitude 44°13′44″N. The tower stands between the Government Wharf and Swift's Wharf at the foot of Brock Street, directly in front of the Kingston City Hall. The water depth in the immediate vicinity of the tower ranges from 2 ft. to 9 ft. During the winter the tower is accessible by an ice bridge, but during the rest of the year it can only be reached by boat. Adjacent to the tower is a breakwater which creates a small boat basin to the west.

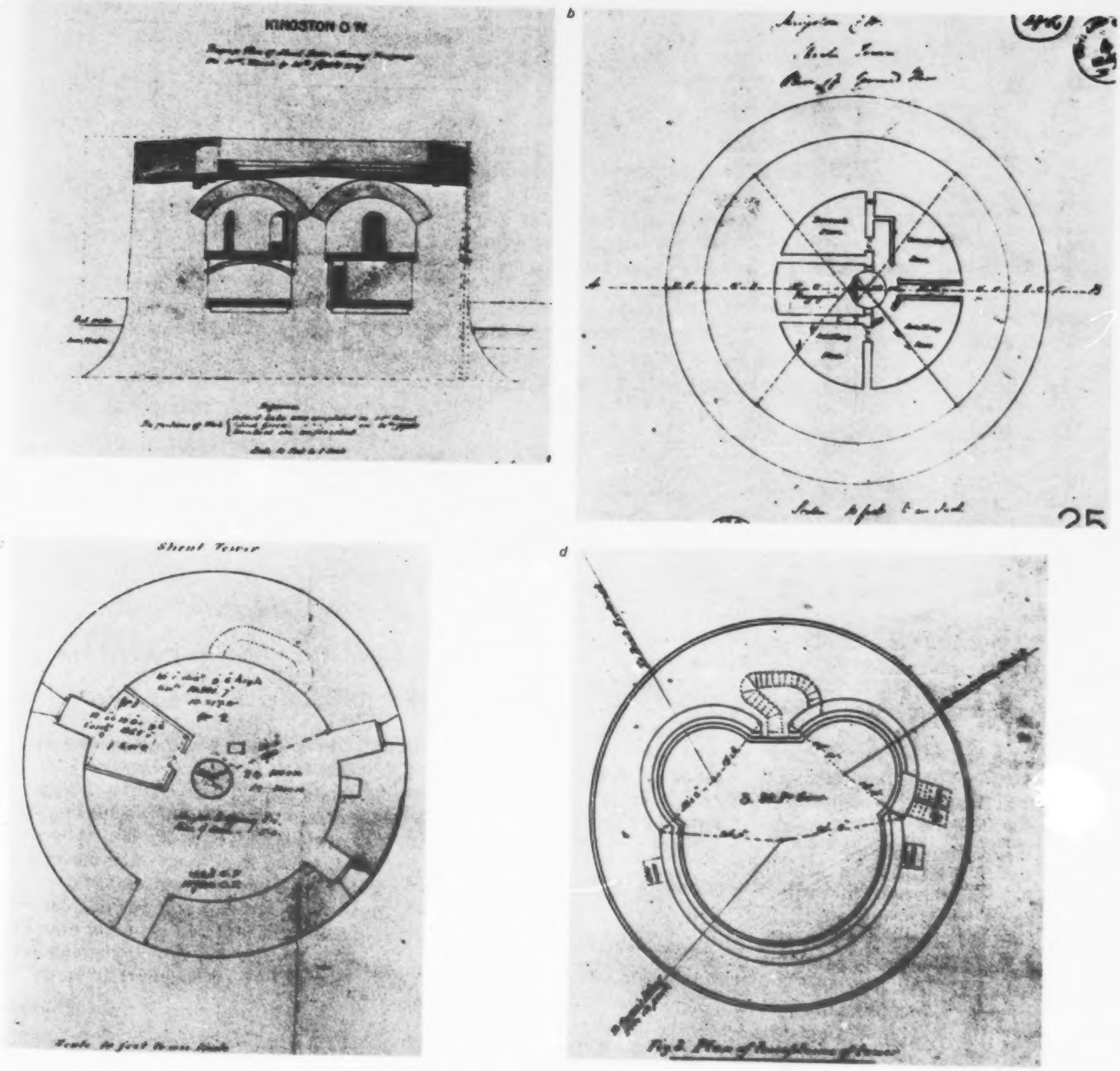
The tower (Fig. 2) was constructed of hewn limestone on an ovoid plan to a height of 45 ft. The long axis of this oval, oriented north and south, is 65 ft. and the short axis is 60 ft. The southern section of the structure's wall is 5 ft. thicker than the other sides. This additional thickness was a result of the need for greater protection from that quarter, or to provide the space needed for a staircase, or both. Inside the tower, however, the plan is circular with a radius of 20 ft.

This tower was the only one of the four in the immediate area that was constructed on a circular plan. The other three were built on octagonal bases that merged into circular plans at the tops of the towers (Lavell 1936: 163). At the bases of these other towers small caponiers opened onto a moat to further protect them, but this defence was not necessary at the Shoal tower.

In 1972 this tower was the object of a cleaning contract and as the work proceded it became apparent that some archaeological research was necessary if a large amount of data concerning the interior layout of the tower was not to be lost. Hence in February of that year, the author and Gerry Crockett from the Technical Services Branch of Indian and Northern Affairs proceeded to excavate and record the interior of the tower.

The author would like to thank Mr. Crockett for his assistance and copies of all his sketches and drawings, and also Graham Barkley of the Central Region Office of the National and Historic Parks and Sites Branch for all of the arrangements he was able to make facilitating the smooth operation of the research. Finally, the author expresses his appreciation for the cooperation and assistance provided by Mr. Armand Leduc, superintendent of the cleaning operation.

The Kingston Market Shoal tower in plan and elevation. *a*, elevation of the tower from progress report in 1847; *b*, plan of the ground floor; *c*, plan of the second level, most of which was devoted to barracks space; *d*, terreplein or gun platform.
(*Composite from plans in the Public Archives of Canada.*)



Historical Background

A detailed historical account by Ivan Sanders of Kingston Harbour, the Market Shoal tower and their relationships to the St. Lawrence River accompanies this report; nevertheless, the historical information presented here will provide the reader with some perspective of the site.

The history of the Market Shoal tower revolves around the history of Kingston and its importance as a key strategic position in controlling the flow of maritime traffic moving from the St. Lawrence to the Great Lakes. The French early recognized this position for its military importance and in 1673 constructed Fort Frontenac on the western bank of the Cataraqui River where it flows into the lake. This position was held by the French until 1758 when it was captured by a British force led by Colonel Bradstreet. The British garrisoned Kingston until 1870 when they, along with all imperial garrisons, were recalled from British North America (Stanley 1954: 21).

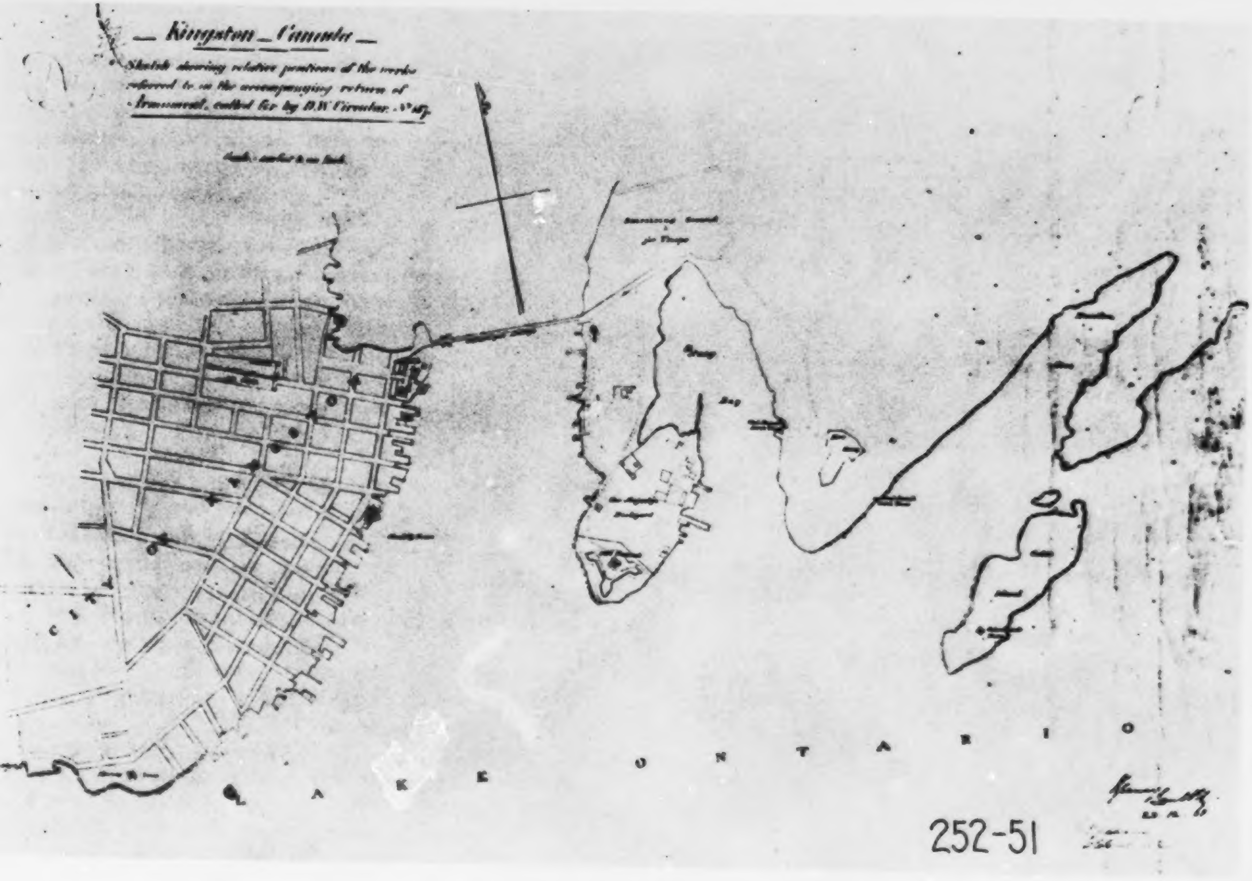
At the termination of the American Revolution a section of the St. Lawrence River was converted into an international boundary, creating further problems with which the British had to cope. The hostilities between Canada and the United States again flared up in 1812, re-emphasizing the need to fortify Kingston against possible attack. In 1813 the first Fort Henry was erected. The disadvantages of using the St. Lawrence River as the only means of water communication between Upper and Lower Canada were also realized and in 1826 Colonel By was commissioned to construct the Rideau Canal. This canal, designed primarily for military reasons, needed to be defended and as a result plans were drawn up in 1829 to erect a system of fortification, consisting primarily of a strengthened Fort Henry and several outlying auxiliary fortifications. Work proceeded slowly on Fort Henry and no progress was really made toward the completion of the auxiliary works. This situation changed, however, as tensions between the two countries heightened with the adoption of the "Fifty-Four Forty or Fight" slogan of the 1844 American presidential election campaign. With the election of James Polk and the Democratic party, Britain began to prepare for war with the United States. This preparation did not go unnoticed by the editors of the Kingston *Argus* who stated in January, 1846,

> *It is not for Oregon we shall have to contend, if contend we must. The blood of the yeomanry of Canada which may be spilled in defence of their homes will attest their abhorrence of the tyranny of Democracy. Britain seeks no war with America – Canada seeks none. But let us imitate Britain and PREPARE FOR WAR as the surest means of securing PEACE.*

The threat was sufficient to incite immediate action on the part of the master-general of the Ordnance and Board, and plans were quickly drawn up for the construction of four Martello towers (exclusive of the two at Fort Henry) for the defence of Kingston Harbour (Fig. 3). The first of these contracts was let on 30 January 1846 for the construction of the Murney Tower, and work proceeded so rapidly that the masonry was ready for testing by 10 June 1846. The contract for the Market Shoal tower was also let in January of that year, but work on it proceeded at a much slower rate.

The construction of the Shoal tower differed from that of the other towers in that it was built on a shallow shoal in the harbour and was completely surrounded by water. This posed technical problems that were not encountered in the construction of the other towers. William Murray was awarded the contract for its construction and he probably sub-contracted the initial work to John Greer. It was Greer's job to construct a coffer-dam (Fig. 4) on the shoal and pump out the water on the site. He set to work immediately, making good use of the ice, and by 20 March 1846 had completed the dam and had begun to pump out the water. This chore occupied 15 pumps manned by six or seven men each until the middle of June when the interior of the coffer-dam was pumped dry. This dam was 90 ft. in diameter and 7 ft 6 in. in height, meaning the displacement of 47,750 cubic ft. of water.

Map of Kingston Harbour.
(Public Archives of Canada.)



— Kingston _ Canada —
Sketch showing relative positions of the works referred to in the accompanying return of Armament, called for by D.W. Circular No 167
L A K E O N T A R I O
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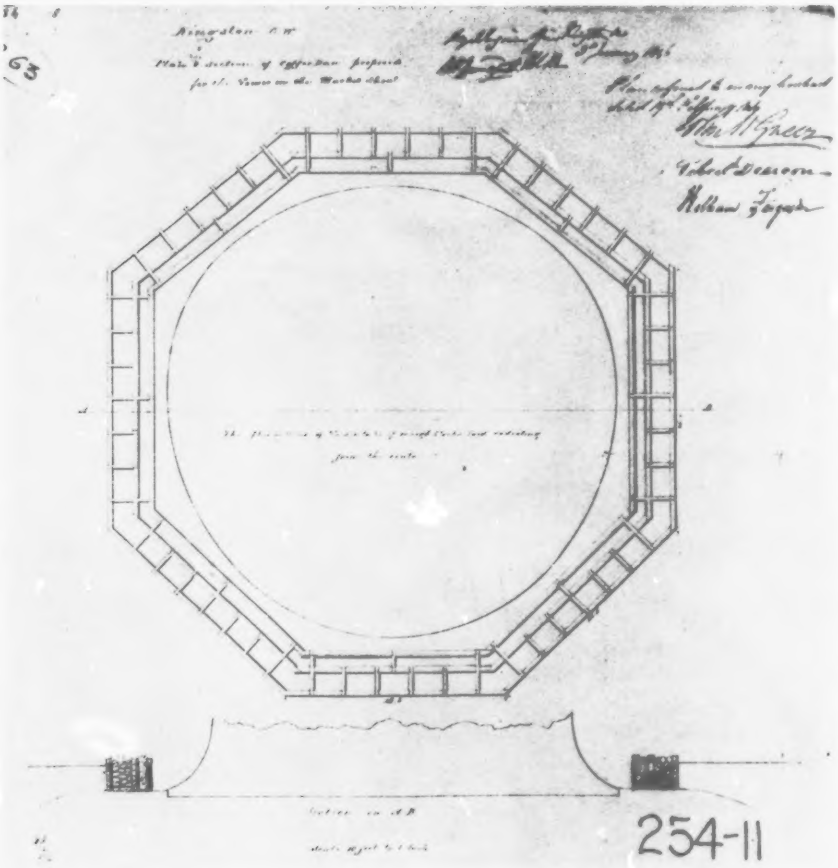
4 Plan and cross-section of coffer-dam as proposed in 1846.
(Public Archives of Canada.)



On 15 June 1846, the Oregon Treaty was signed and this project, begun with the utmost urgency, slowed considerably; it was not until October of 1847 that the tower's construction was completed. Although the tower was completed in 1847 it was not armed for another 14 years.

The garrison for the tower was never very large and for the most part it was placed on a maintenance basis or was looked after by a caretaker. It was first occupied in 1849 by four guards, and between then and 1854 the number of men never rose above seven. In 1855-56 the tower stood vacant because of the Crimean War, but as a result of Britain's involvement in the United States Civil War, the garrison increased to 23 men. These men were all single, whereas before the tower was used for married quarters. After the crisis in the United States had passed, the number of men again declined to its previous 1850s level.

The tower was occupied by a British garrison until 1870 when, as stated above, all imperial troops were withdrawn from British North America. At that time it was turned over to Lieutenant Colonel Wyly, Director of Stores of the dominion government, and kept on a maintenance basis for 10 more years. After this period it was considered obsolete and was therefore abandoned.

A local informant stated that the ower had been occupied at the turn f the century and later by a Kings-on family, but this story has yet to e substantiated; however, such n occupation would explain the ecovery of certain artifacts such as toys. After final abandonment, the tower languished until the mid-20th entury when it was re-roofed to rotect it from the elements.

Excavations

When the author arrived on site, a great deal of the cleaning of the gun platform had been completed and cleaning of the first level had begun. Until contractual arrangements had been made, the author could only observe the cleaning process and investigate areas of particular structural interest.

This Martello tower had been the home of innumerable generations of pigeons and bats and their dung and deceased along with fallen brick, masonry, wooden mouldings constituted the fill inside the tower. The weight of this debris and the subsequent deterioration which the tower underwent after it was designated obsolete brought about the collapse of the second-level wooden floor. This in turn caused the partial collapse of the ground floor into the air space below. After this collapse the wood of the floor continued to rot and the overlying detritus filtered down into the bottommost air space and in time the whole became an undifferentiated mass. Over the period of deposition the accumulated rotten wood and guano had broken down into a fine powdery dust which created considerable problems during its removal. As a consequence these factors made the employment of traditional excavation techniques impractical, and excavation consisted primarily of careful removal of the fill and recording of the features that remained *in situ*, mainly floor joists and flooring.

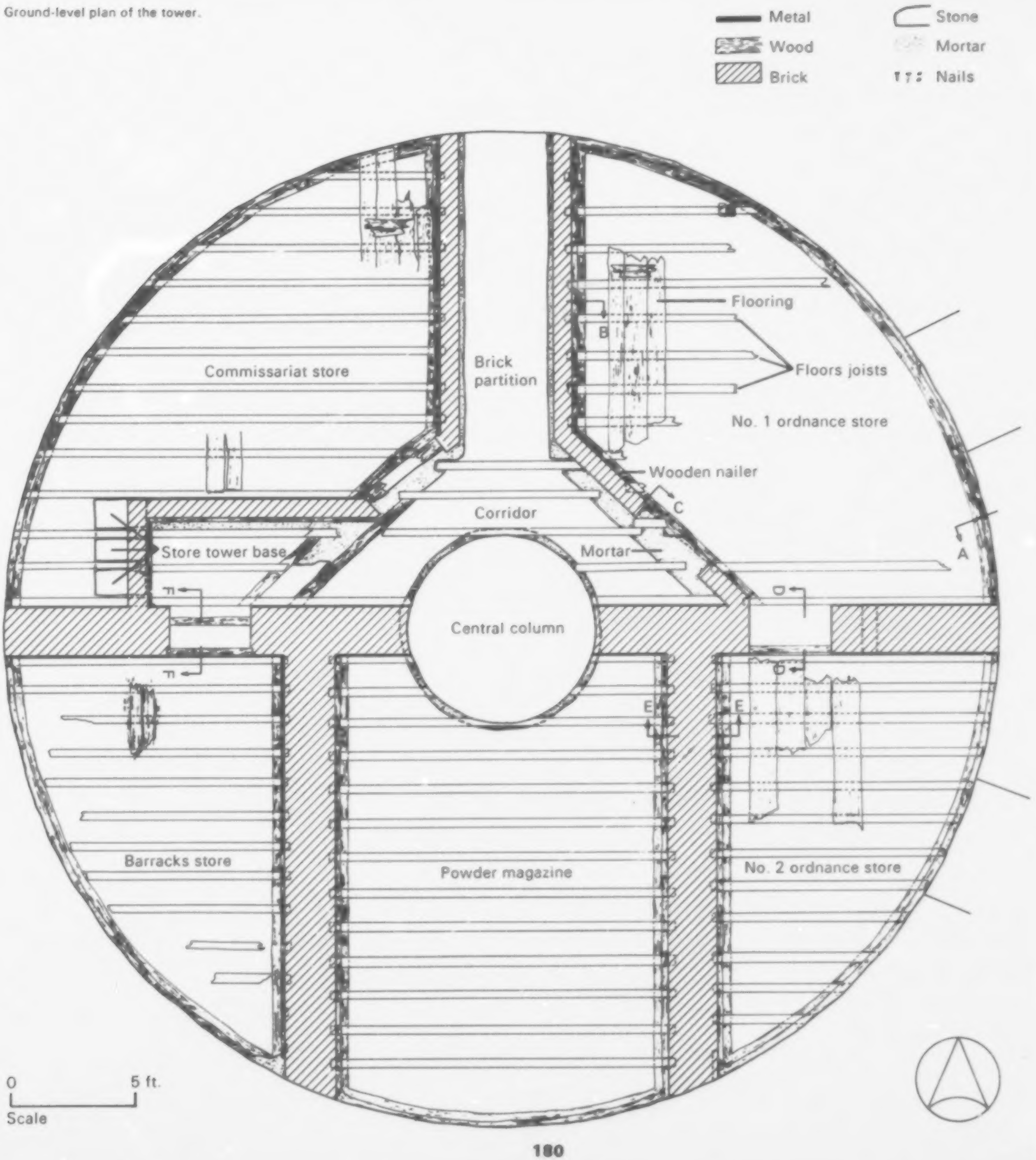
The operation-lot system used by the National Historic Parks and Sites Branch was employed on this site. The tower proper was given the code number 16H and each of the floors and their respective rooms were given related provenience numbers. All artifacts recovered were recorded as to these proveniences except those which were found prior to the arrival of the archaeologist on site; these were given a general provenience number.

The following discussion details the excavations conducted on the site, and begins with the ground floor. Only the windows, boiler, top of the magazine and the floor area above the No. 2 ordnance store required any excavation on the second level, and on the third level only the latrines were cleaned. As mentioned previously the rest of the third level had been cleaned prior to the arrival of the archaeologist.

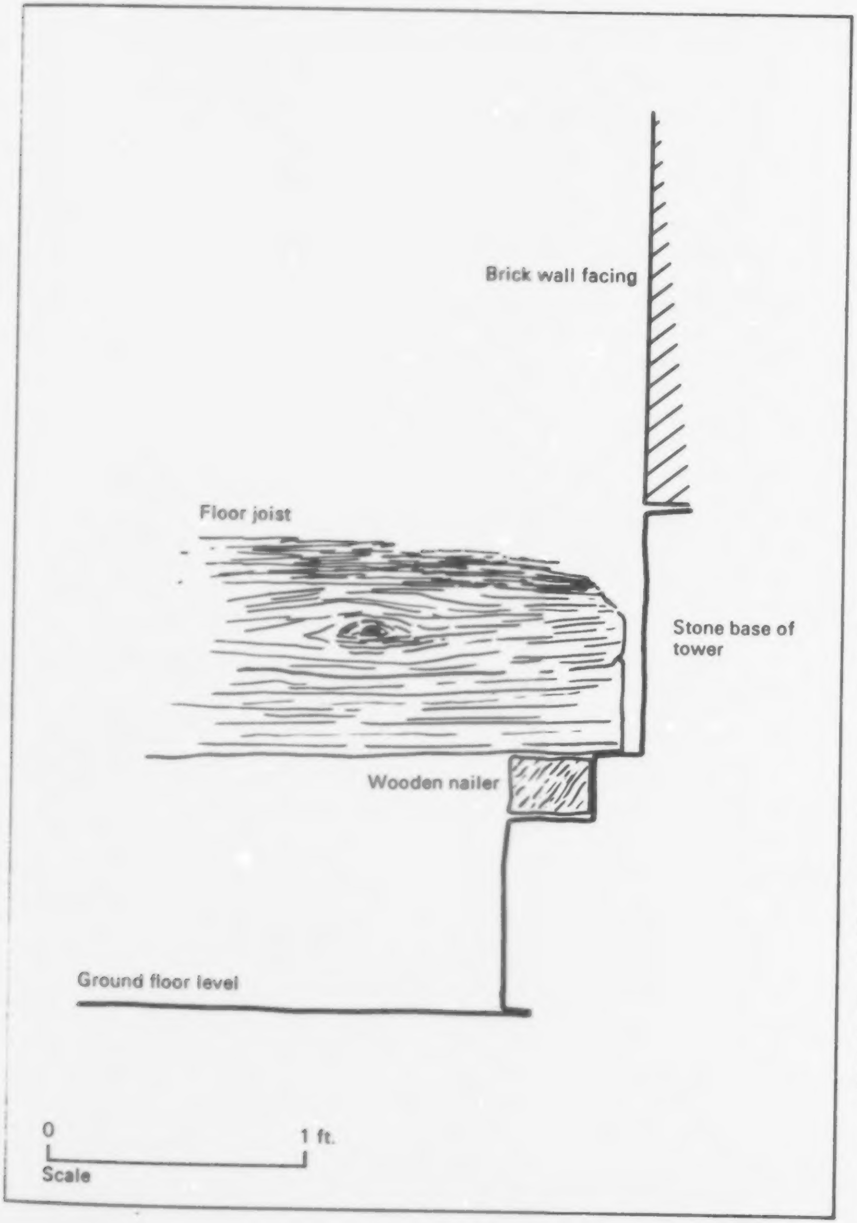
The Ground Floor

The ground floor of the tower (Fig. 5) was divided into five rooms or stores. These were all connected by a corridor to a set of stairs that led up to the second or main level of the tower. In the exterior wall of the commissariat stores there was an arched chamber, but the function of this feature is still uncertain. These rooms as seen in Figure 2 were the No. 1 ordnance store, the No. 2 ordnance store, the magazine, the barracks stores and the commissariat stores. The two other structural features recorded on this level were two windows that opened onto the corridor from the magazine. Centrally located in the tower was the main support pillar for the entire structure.

5 Ground-level plan of the tower.



Cross-section of the exterior wall with floor joist edge, detail A.



The tower was circular in shape and the interior rooms on both the ground and second-floor levels were more or less wedge-shaped with the exception of the powder magazine which was rectangular.

The basic platform upon which the tower was constructed was composed of undressed limestone set in mortar radiating out from the centre of the tower. This floor was unevenly levelled and never intended as a working area. Above it and separated by an air space of 7 in. were the floor joists upon which the flooring was laid.

Along the inner perimeter of the exterior wall the floor joists rested on a ledge and butted directly against the inner face of the wall. This ledge, shown in Figure 6, had a double step in it. The joists keyed to the topmost step and rested on a wooden nailer laid along the bottommost step. This nailer, though broken in spots to allow for partitions, continued around the entire perimeter of the interior face of the wall. The ledge was cut from limestone set in the base of the wall. This stonework continued up the face of the wall from the stone floor approximately 2.15 ft., or to the top of the floor joists. At this point the stone was discontinued and the facing material was changed to brick. The first course was a header course and the second, third and fourth courses were stretcher courses succeeded by another header course.

All of the floor joists on the ground floor were laid on an east-west axis, parallel to each other in all rooms. These joists measured approximately 4 in. by 12 in. Approximation of measurement was made necessary as a consequence of the deterioration and shrinkage that these structural members had undergone. In the various drawings included with this report detailed dimensions are provided.

Central Corridor

The connecting corridor between the various rooms on the ground level was basically Y-shaped. The stem of the Y was the stairwell to the second level. The eastern arm led to the No. 1 ordnance store and the western arm led to the commissariat and barracks stores. This western arm had a dog-leg section as shown in Figure 5.

Of the seven original floor joists that were laid in the corridor, only remnants of six remained. These joists were in a very deteriorated state and several crumbled into dust during excavation. The joists had butted into recesses about 7.5 in. deep in the masonry partitions of the corridor. Beneath the joist the masonry had been slotted for a nailer which still remained in place. This nailer was approximately 3 in. by 4 in. and was recessed into the masonry beneath the joist. Above the joist and at the top on the stone masonry was a small ledge 7.5 in. wide on which the floor rested. At this same level the brick corridor partition was begun. This partition was the width of one brick length. The bricks were laid in the same fashion as those in the interior face of the other wall; that is, one header course for every three stretcher courses. In the main area of the Y of the corridor there was no flooring present on the remaining floor joists.

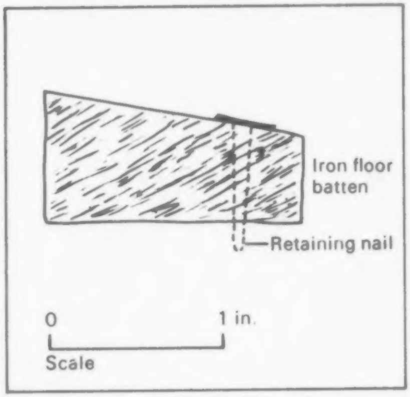
Dog-leg

Turning west off the main line of the corridor was a short extension which connected the barracks stores with the rest of the ground level. This extension also enabled the personnel of the tower to close off the commissary from the rest of the ground level without closing the barracks stores.

There were three floor joists in this extension area which were continuations of the floor joists in the main part of the corridor. These joists were fixed in slots in the western partition wall of the corridor extension. The slots continued all the way through the stone masonry into the small alcove of the commissary, but the joists were not continuous, stopping at the partition wall. Above the joists was a small ledge 1 in. to 2 in. in width upon which rested the floor.

There were some remnants of the floor still in place on the joists, but these were very fragmentary. Also in place were cast iron bands which had held the floor in position. These perimeter bands which were found throughout the entire structure were screwed into place and it was surmised that they acted to prevent the floor from shifting or warping during times of action. Figure 7 is a cross-section of this band, which was trapezoidal in shape with a bevel on the upper side. That they were produced specifically for this building is certain, because all of the corner angles and curves are cast to fit.

7

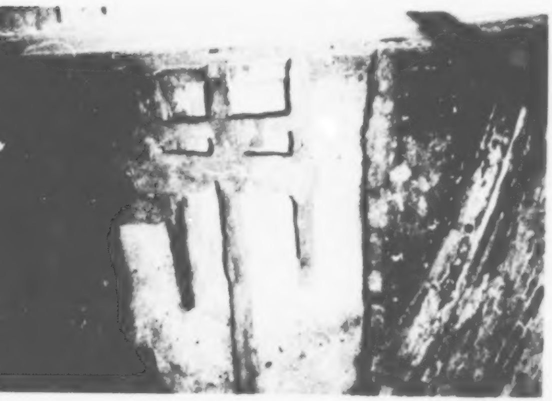


7 Cross-section of iron floor batten with nail.

At the eastern end of this extension or at the edge of the arm of the Y was a diagonal strip of stone masonry. This piece of masonry acted as the sill to the doorway leading into the commissary and as the base of the brick partition. In this instance the construction parallels that which was used in the eastern arm of the Y and it became a support for the floor joists which ran into the extension. Along both sides of this strip were nailers, and the segment of the masonry near the commissary was slotted to receive the northernmost joist in the corridor extension.

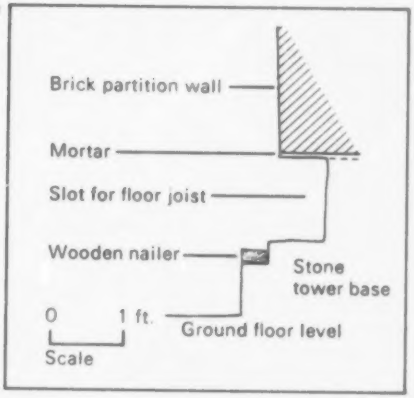
No. 1 Ordnance Store

The eastern arm of the corridor provided access to the No. 1 ordnance store (Fig. 5). This room was mnants of flooring in the No. 1 ordnance store. is possible to discern in this photograph frag entary evidence of finished flooring. The camera facing down and to the south.



9 Cross section of the interior brick partition wall footing and floor joist slot, detail B.

9



runcated wedge-shaped space ectly beneath the main entrance the tower. It was assumed from e large number of grape shot found the northern corner of the room at it was primarily used for the orage of shot. Prior to excavation, e room was filled to a level of proximately 5 ft. with debris and was the first room to be cleared. e reason for this was the need a work space for the clearing of e remainder of the tower.

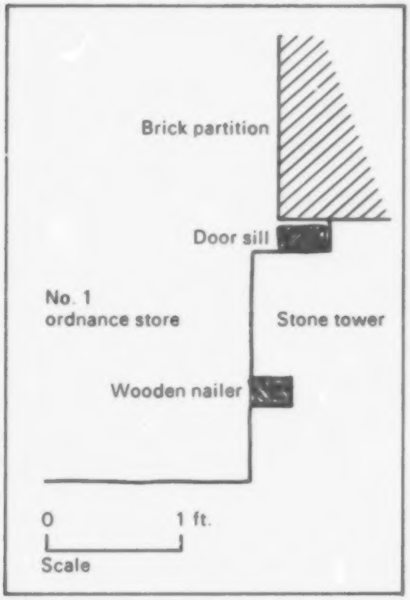
The stone floor conformed to that eady described as did the interior e of the exterior wall. Again the or joists were laid parallel on east-west axis and 14 joists were ployed. This wooden floor (Fig. 8) d the floor inside the barracks res had suffered most from the ects of the elements. Both of se floors had been exposed to isture which combined with the ects of the dung had brought out a severe state of deterioration.

The 10 remaining joists extended about halfway into the room and still retained some flooring. There were several planks of sub-flooring remaining and evidence of what might have been finished flooring. This was very fragmentary and no finishing nails for retaining such a floor were found. It may be that evidence which was construed as being finished flooring was nothing more than remnants of planking from the second level that had fallen onto the floor and adhered to that floor in the process of decay.

The joist support for the exterior wall has already been described; Figure 9 is a detail of the system used to support the joists that butted against the interior partition walls. This detail conforms to the system used throughout the interior of the tower on the ground level. In this instance the joists were inserted into slots in the stone masonry, but bore directly on a nailer which rested on a ledge below them in the same masonry. The distance between the bottom of the joist and the stone floor below was approximately 11 in. The floor planks on the top of these joists were approximately 1⅞ in. by 10½ in., but this size was not consistent throughout the structure.

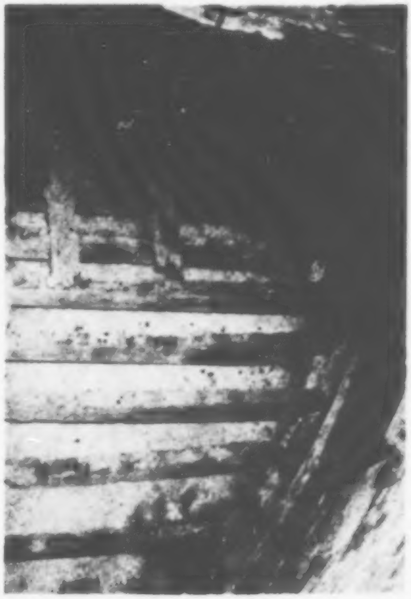
The door sill of the entrance to the No. 1 ordnance store was wooden and rested directly upon the stone masonry that formed the base of the entire superstructure. In this case, as can be seen in Figure 10, the floor joists rested on their wooden nailer, but above them another wooden member 4 in. by 6¼ in. had been inserted between the stonework and the brick partition. To this member the flooring was attached. Adjacent to the entrance of the room was the doorway to the No. 2 ordnance store.

10



10 Cross-section of doorway between corridor and No. 1 ordnance store, detail.

11



11 No. 2 ordnance store as excavated. The joists are still in place and two pieces of the iron floor batten can still be seen along the wall. The nails in the tops of the floor joists are wrought and were used to fasten down the flooring. The camera is facing northeast. Scale, 2 ft.

No. 2 Ordnance Store

The No. 2 ordnance store was a small brick-vaulted room through which personnel had to pass to get to the magazine and was, in fact, the only access to the magazine. Entrance was achieved through a door in the north partition wall of the room. The floor structure of this room was in better repair than in any of the other rooms in the tower. The floor joists were intact and in place, and some of the flooring still remained on the joists as shown in Figures 5 and 11. The brick partitions forming the walls for this ordnance room were 1 ft. 11⅜ in. thick and the bricks were laid in the same manner as described previously. The air space below the joists was 9½ in. The remaining flooring was laid on a north-south axis and had a thickness that varied from 1¾ in. to 1⅞ in. The widths and lengths of these planks varied.

The doorway to the room (Figs. 12 and 13) had a sill similar to that found in the No. 1 ordnance store in that on each side of the stone and mortar masonry sill were two wooden members that were recessed into the brick partition wall and to which the planking of the floor was attached. When excavated the flooring was still in place on the sill and held there by bevelled iron straps.

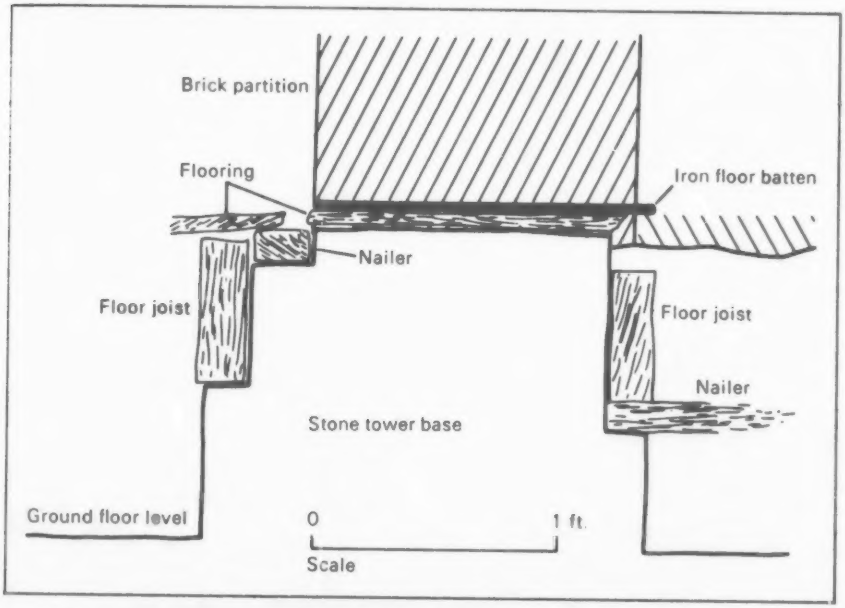
The joists themselves were butted against the interior face of the exterior wall in the same manner as discussed under the general comments concerning the ground level. Their opposite ends were butted into the slotted interior partition as in the No. 2 ordnance store. The distance between the joists ranged from 9⅞ in. to 1 ft. 1½ in.

The ceiling above this room was of arched brick construction, although most of it had collapsed probably as the result of meltwater and rain leaching out the lime which bound the mortar between the bricks. This arch, which will be discussed in more detail later, curved from east to west in a direction opposite to the arch of the magazine, which was entirely intact. The doorway to the magazine was in the west wall of this room.

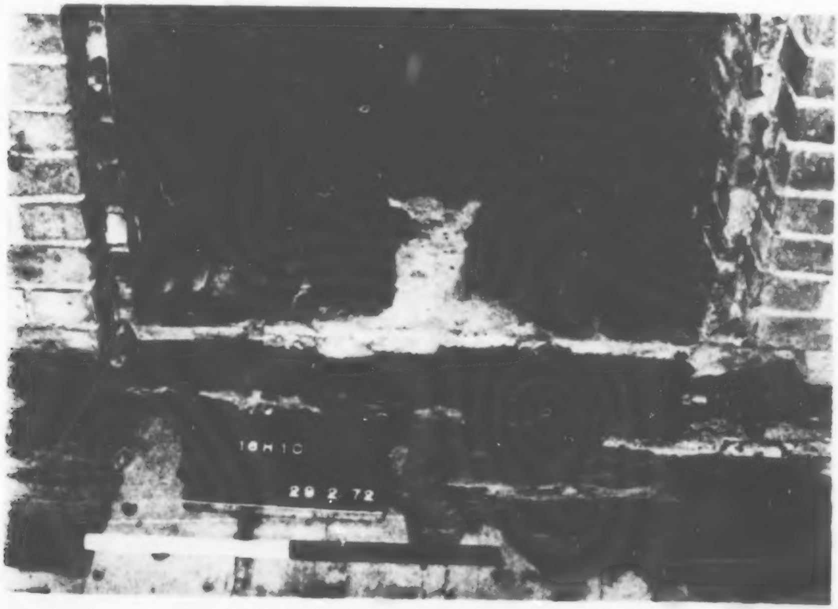
The Powder Magazine

Because of the dangerous aspects of the powder magazine special attention was paid to its construction. The following description of its construction and usage is quoted here:

It was entirely bricked over to protect the contents from the damaging influence of any dampness from the stonework. The brick across the ceiling reinforced the floor above and served as an added protection against shot which might otherwise crash through during an engagement. Along the walls air spaces were built to allow free circulation and lessen the danger of spontaneous combustion.



1. Cross-section of doorway between the two ordnance stores, detail D D.



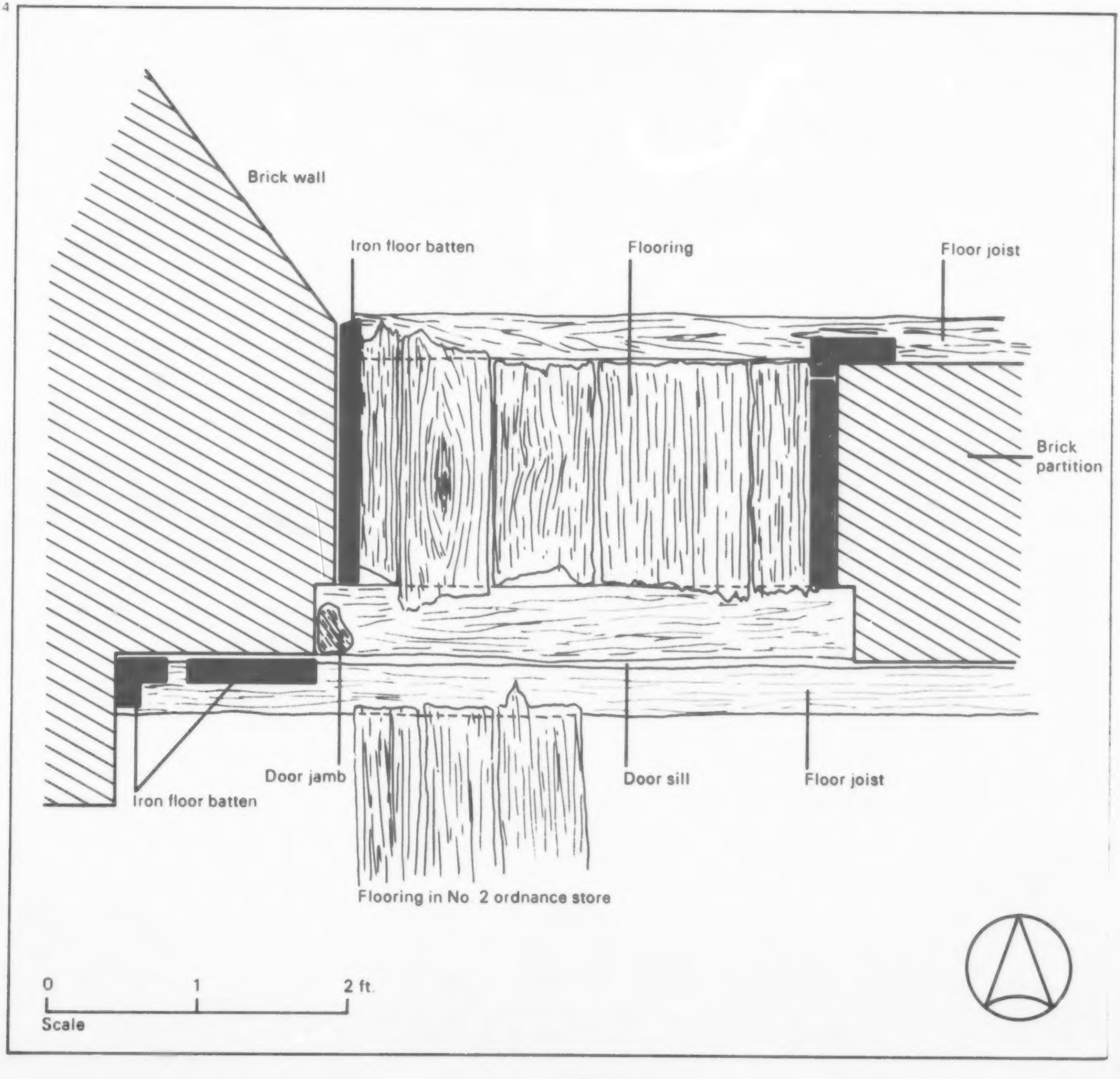
13 Door sill of No. 2 ordnance store as excavated. Note the notches in the brickwork for the door frame View is from the north looking into the room.

While these precautions were taken to prevent nature from causing damage, others were taken to see that no harm should result from human carelessness. Metal nails, for example, in the boot soles coming into sharp contact with metal nails on the floor, might generate a spark which, in a magazine with a capacity for sixty-six barrels and seventy-four cases of gun-powder, would cause tremendous damage. Every man detailed to visit the room was therefore required to wear softsoled shoes, and all floors and benches within it were laid down with wooden pegs. Metal was placed nowhere but on the outer side of the door and although this metal was copper sheeting which had not the same tendency as other metals to produce electricity through friction, it was heavily coated with insulating paint.

With lanterns burning in other parts of the building, and with metal in many places as well, it was imperative to exercise special care in putting powder in or taking it from the magazine. There was always the possibility of a small leakage, and a small draft, created even by a door opening or by a person moving about, might be sufficient to blow loose particles into the main part of the building and into direct contact with flame and friction. To minimize danger the magazine was made almost foolproof. Anyone wishing to enter it had first to open an outer door leading from the corridor at the centre of the building, which he was obliged to shut behind him before going further. Opening next an inner door he not only gained access to the magazine proper, but

14 Plan view of the doorway between the two ordnance stores.

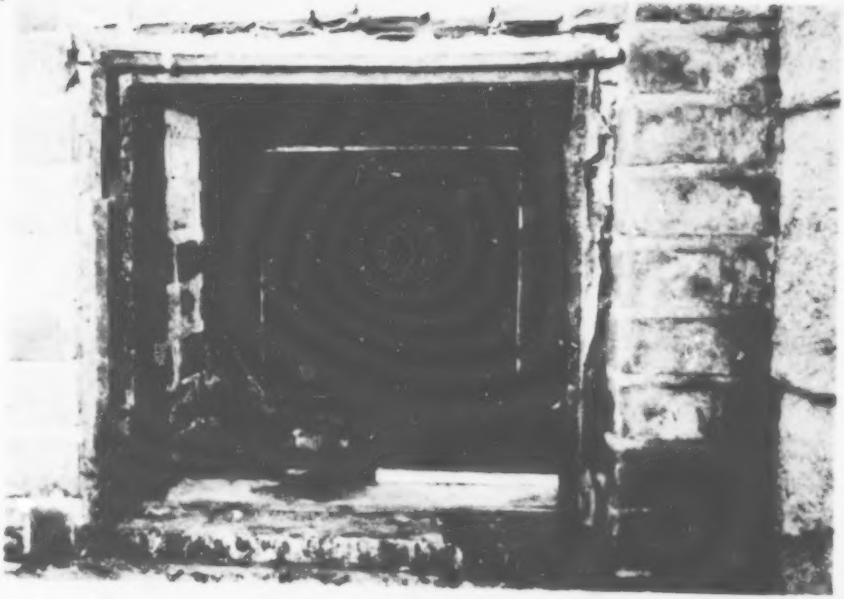
14



also made the room temporarily larger by the area of the passageway between the inner and outer doors. The powder required was placed in this passage and the inner door was closed, after which the outer door was opened and the centre of the building reached. By the use of double doors the interior of the magazine was never in direct contact with the rest of the building. To give light an aperture about two feet square went through the magazine's brick wall about five feet from the floor to a closet off the corridor. This aperture was fitted with a movable pane of glass, flush with the inner wall of the magazine, with a large sill behind it entirely cut off from the magazine. A burning lantern placed on the sill shone through the glass into the magazine without any risk of danger [Lavell 1936: 171].

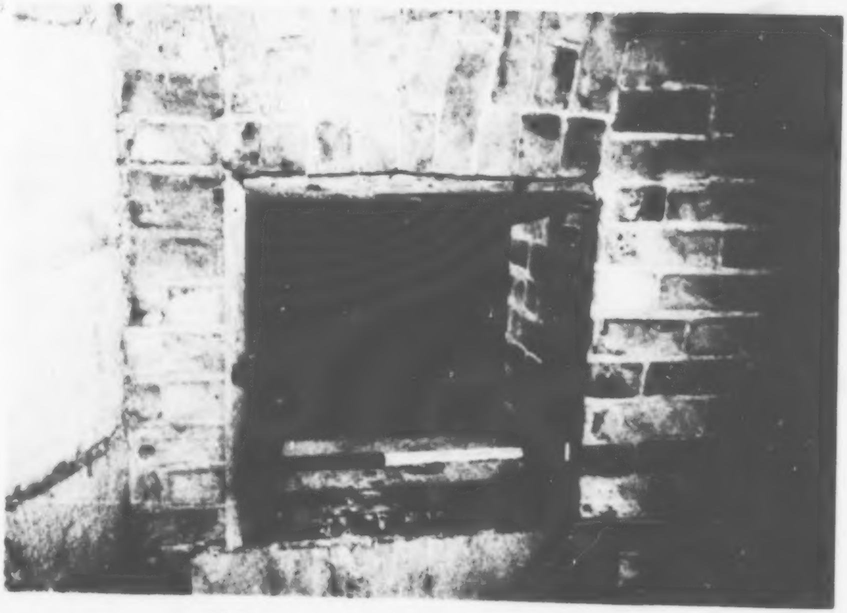
This account of the powder magazine (Fig. 5) was substantiated by the excavations of that room. It was impossible, however, to make any observations concerning the floor as this had been destroyed almost completely during a fire at some time in the past. The brick walls and the overhead vault were still intact and it was possible to locate the positions of the floor joists from the slots in the masonry (Fig. 14). It may be assumed that the flooring was held in place by wooden pegs because of the small amount of debris found in the room. This assumption was based more on negative evidence than anything else, because there were very few nails found on the stone floor and none that could be directly associated with the wooden flooring. As might be supposed this was also

15



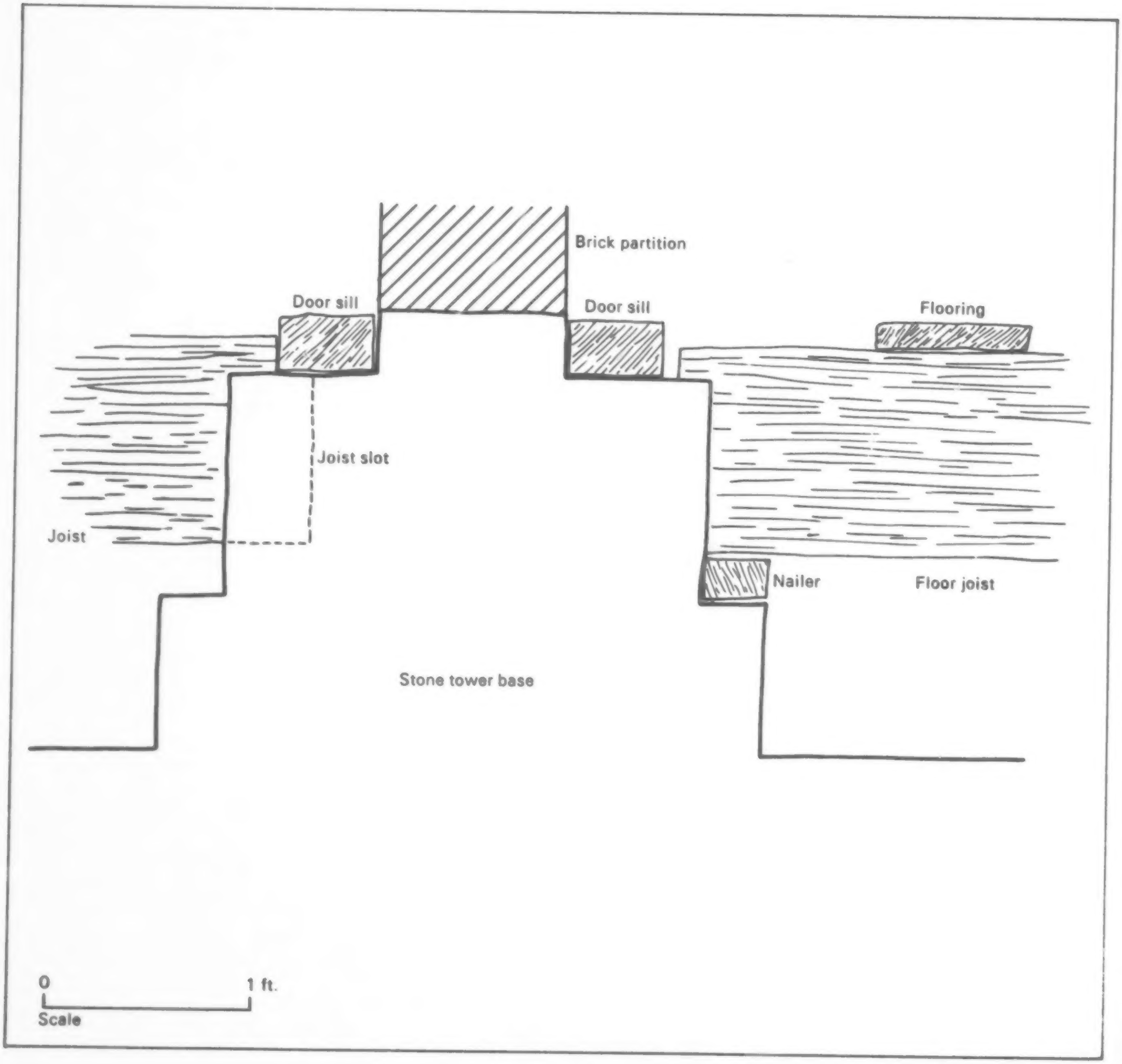
15 Eastern window of the magazine taken from the north. Note the hinges and depth of the casement. The window opened outward toward the viewer.

16



16 Western window of the magazine taken from the north or corridor side of the window.

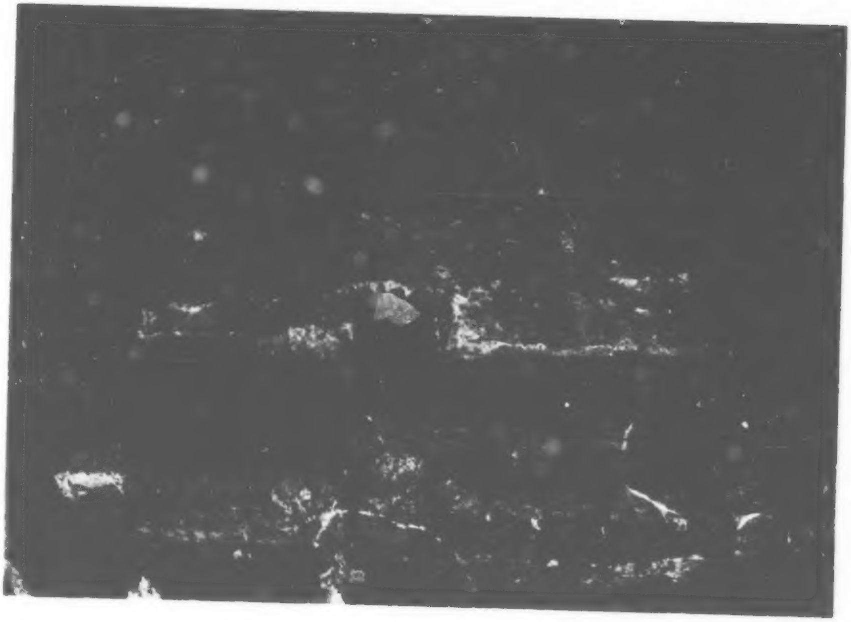
17 Cross section of the doorway between the powder magazine and the No. 2 ordnance store, detail E-E, illustrating the double door sill arrangement.



the only room in which no iron floor batten was found. As to there being no iron work in the room, it should be stated that the wall racks were held in place by iron wall anchors.

Lavell's description of the window arrangement was correct as well. As can be seen in Figures 15 and 16 these two windows were both inset in the magazine wall and they were glazed with double panes. Excavation of the window sills provided examples of cast plate glass 15/64 in. thick. The window surrounds were also sheathed in copper and the hardware was cast brass. Both windows were hinged on the corridor side, but the framing was screwed into place with copper screws on the magazine side. These windows were approximately 2 ft. square and they were set on granite sills.

The entrance to the magazine was also double-doored as described by Lavell, although the doors were missing. There were still remnants of the framing remaining and these too were copper sheathed. The distance between the two doors was only 22⅜ in., not giving a man much room to manoeuvre. The sill itself was composed of a mortar masonry core with two wooden members, one on each side of the sill. This sill (Figs. 17 and 18) was different from the other door sills in structure, but the structural significance of this difference is as yet unknown.



18 The powder magazine door sill as excavated. Note the slot in the sill and double framing on the door. View is from the powder magazine or the west.

Barracks Store

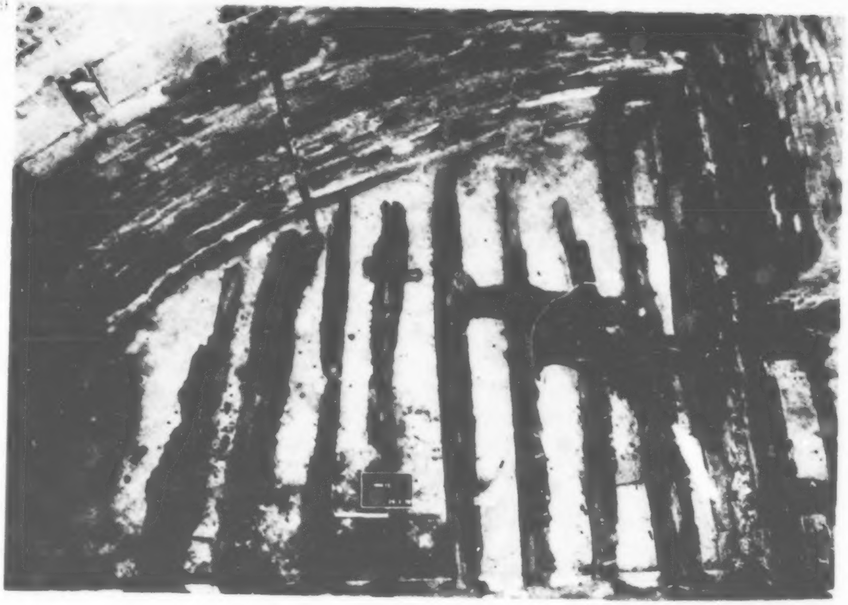
The barracks store lay to the east of the magazine and was identical in plan to that of the No. 2 ordnance store. It had, however, been exposed to the elements to a greater extent, and the joists were in an extremely deteriorated state. These crumbled to the touch and a great deal of caution had to be exercised in the excavation of the room. Figures 5 and 19 present this room in plan and as it was photographed after excavation. As can be seen the floor joist support system was the same as that found in the rest of the building.

The only access to this room was through a door in the northern partition wall. The sill in this instance still had remnants of flooring and the wooden sill members remained in place. It was constructed somewhat differently from that of the other sills in the building in that there was one wooden member down the centre of the sill and one on the room side of the sill. On either side of the sill were floor joists. This detail is illustrated in Figures 20 and 21. Also in place was the iron strap batten that held the flooring in position.

Commissariat Stores

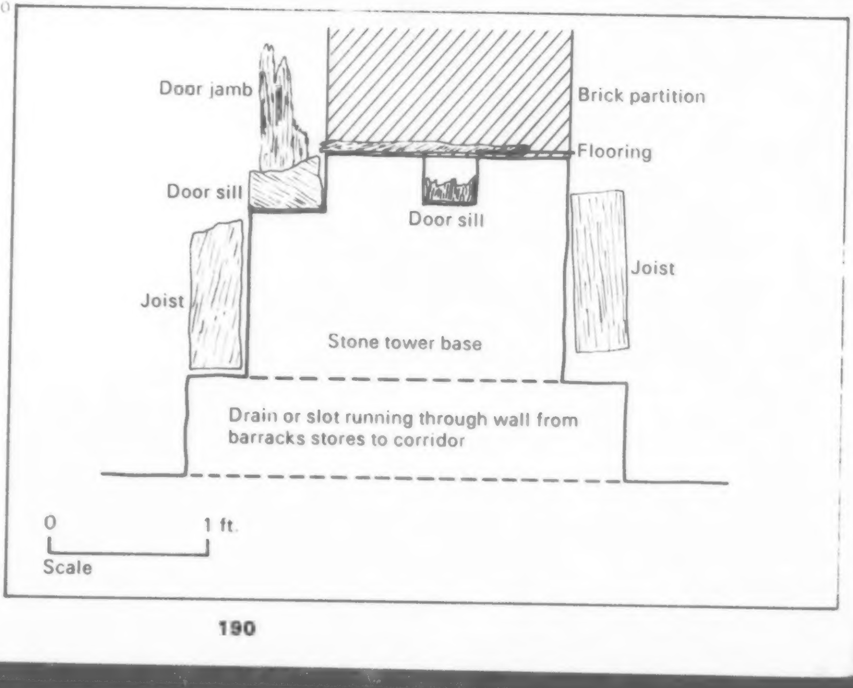
Situated in the northwest quadrant of the tower was the commissariat stores. This room was basically wedge-shaped as was the No. 1 ordnance store with the exception of the corridor extension which led to the barracks store. This extension created a small alcove in the western corner of the room as can be seen in Figures 5, 22, and 23.

19



19 The barracks store floor as excavated. Note the deteriorated state of the joists in this room. Leaning against the wall is a section of the iron floor batten that had fallen from the room above. The small stone faced opening is a blocked up air vent. View is from above and the east. Scale, 2 ft.

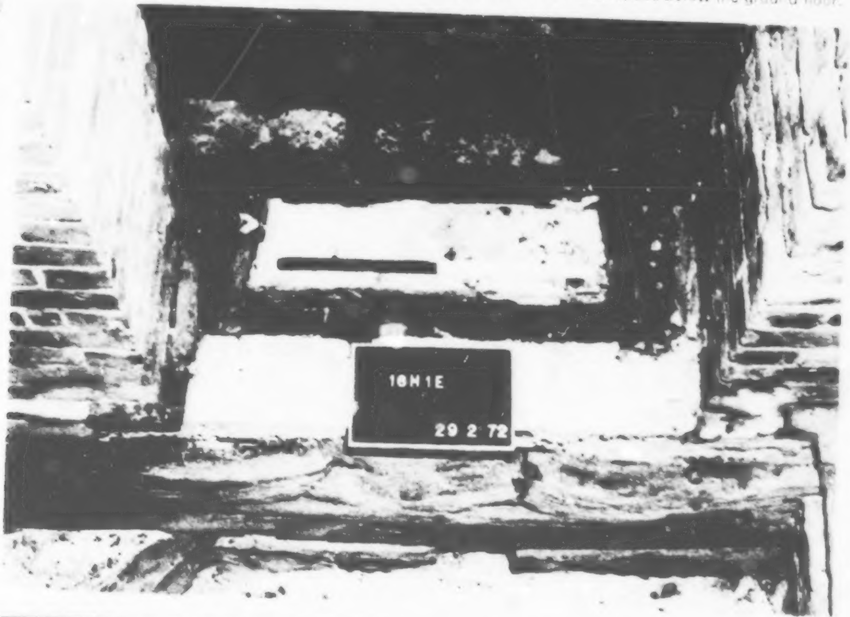
20

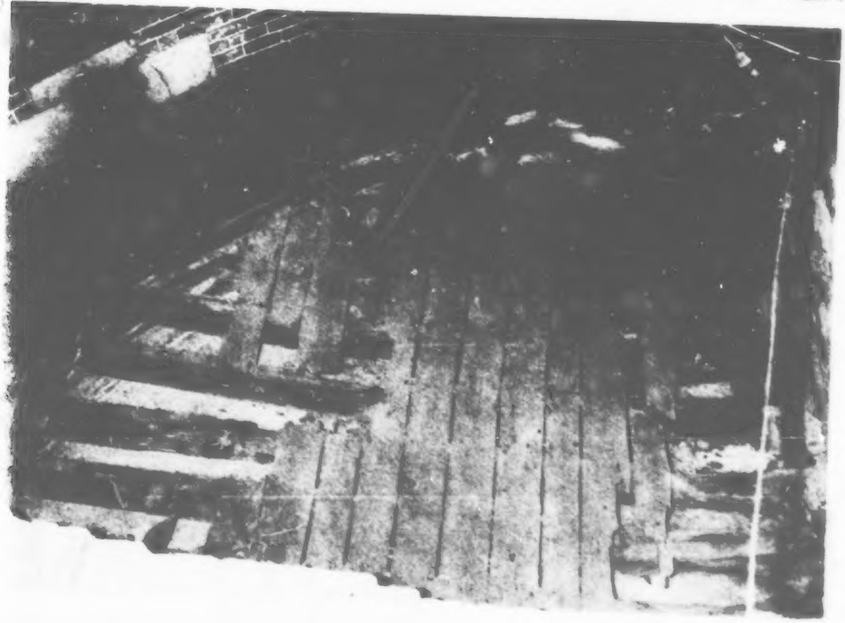


20 Cross-section of the doorway between the barracks store and the corridor, detail F-F.

21 Door sill of the barracks store as excavated. Note the differences of construction in this sill and the others in the tower. The masonry in this sill is moulded to receive two horizontal members, one in the middle and the other on the barracks store side of the sill. The doorway to the magazine is also slotted for two horizontal members but on both sides of the sill, and these are part of the double door framing. The doorway into the No. 2 ordnance store is not slotted for horizontal members and the flooring is attached to the two floor joists in the adjacent rooms. View is from the north or the corridor side of the door.

22 The commissariat as excavated. View is from the south showing the flooring and a joist that had collapsed into the air space below the ground floor.





The joists and flooring, relatively intact and in place, had partially collapsed into the air space below. Like the No. 1 ordnance store this room had 14 joists, and the nailer around the perimeter of the room, which was absent in the ordnance store, was still resting on its ledge. This nailer was spliced in several places with a simple scarf joint as shown in Figure 24, and the joists were connected to the nailer with a half lap joint. The joists that ran through the small alcove did not continue into the corridor, but butted against the corridor's joists. These shorter joists measured approximately 5 ft. in length.

The sub-floor planking was still in place and there was some evidence of finish flooring on top of this. The iron batten was also in place.

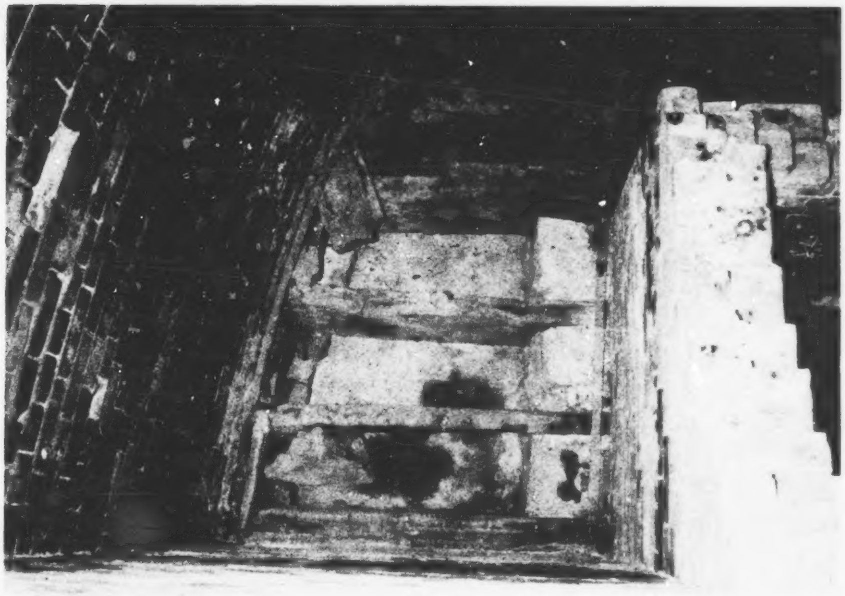
Pantry

Built into the exterior wall of the commissariat store room was a feature which was first thought to have been a firebox or oven of some sort, but excavation has almost eliminated this possibility. Currently it is believed to have been some sort of storage facility such as a pantry for butter and meats. The reasons for discarding the assumption that this was a firebox are several: first, what was thought to have been a flue later proved to have been the drain from the latrine on the third level; second, there were no facilities for a grate or ash removal; third, the walls of the feature showed no evidence of carbon; and fourth, the majority of all food bones were found here.

23 The alcove in the commissariat as excavated. View is from the south.

24 Detail of scarf joint in perimeter nailer in the commissariat store.

23



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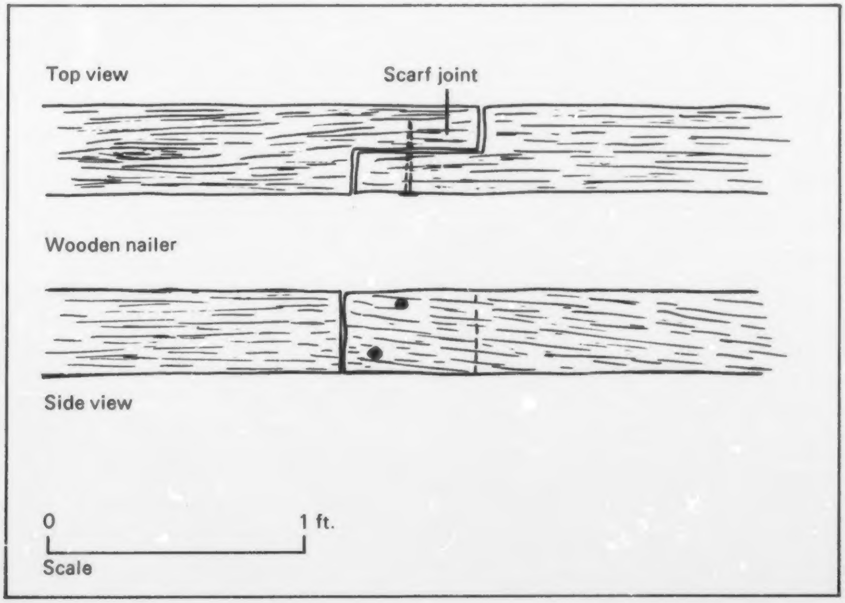


This pantry, if such it was, is shown in Figures 25, 26 and 27, and the entire feature gives the impression of having been added at a later date, as demonstrated by the quality and nature of the brickwork around the opening. The top of this opening was arched brick which continued to the rear of the pantry; however, the side walls were poorly dressed limestone and the rear wall was a combination of this type of limestone and rubble. A 9-in. cast iron pipe from the latrines on the terreplein passed through the pantry to the water approximately 15 ft. below. This pipe had been shattered at some time after the tower's abandonment, because no fecal or organic matter was found around the opening of the shattered pipe.

The Second Level

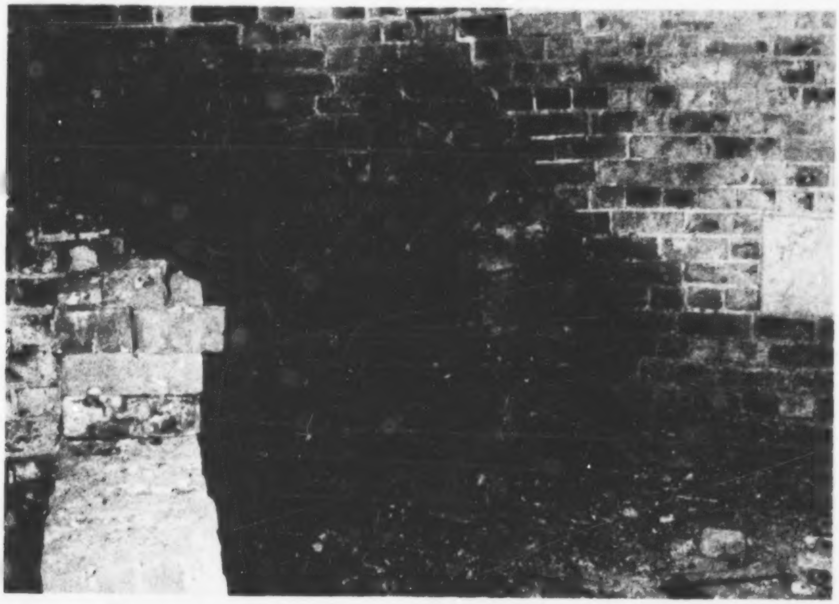
The second level (Fig. 2) was the main or barracks level of the tower, whereas the ground level was the storage level. This second level had at one time contained the entrance foyer, the officer's quarters and the soldiers barracks. Also situated on this level were three windows for the placement of 32-pounder carronades, a boiler for heating water and a hand pump for bringing water up from below. Leading from this level on the southern side of the tower were the stairs to the third level.

At the time of excavation little remained of this level that could be recorded, and for the most part the wooden floors had collapsed onto the ground level. The exceptions were the brick arch of the magazine which was still sound and a remnant of the brick arch that had once

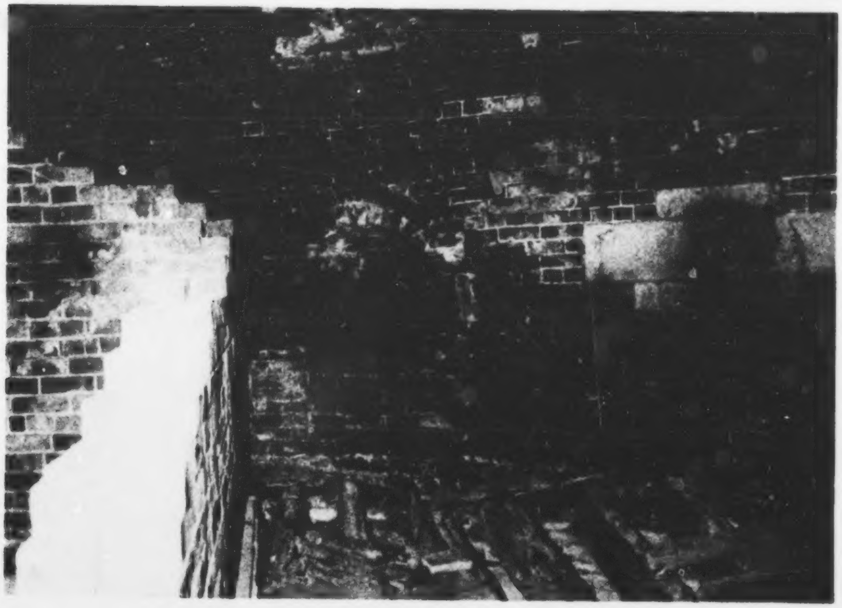
2 Pre-excavation view of the pantry from the east. The pantry and commissariat store outside were both filled with debris to a depth of 3 to 4 ft.

26 View of pantry after excavation. Note the bonding or lack of it in the brickwork around the aperture of the pantry. View is from the east.

2



26



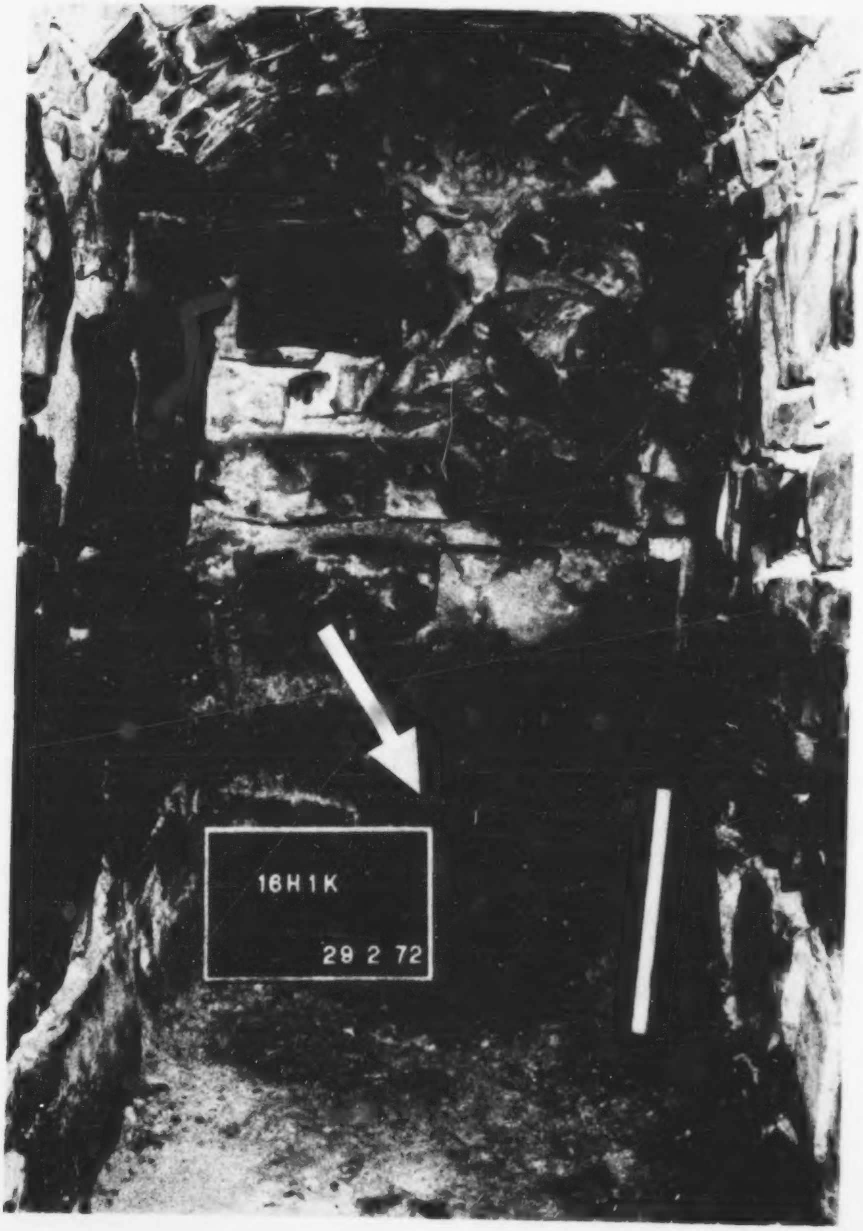
been the ceiling of the No. 2 ordnance store. The window sills were still intact, but their floorings had suffered considerably from the effects of weathering. Only one of these was successfully excavated, it being the one nearest the entrance.

The Roof of the Magazine

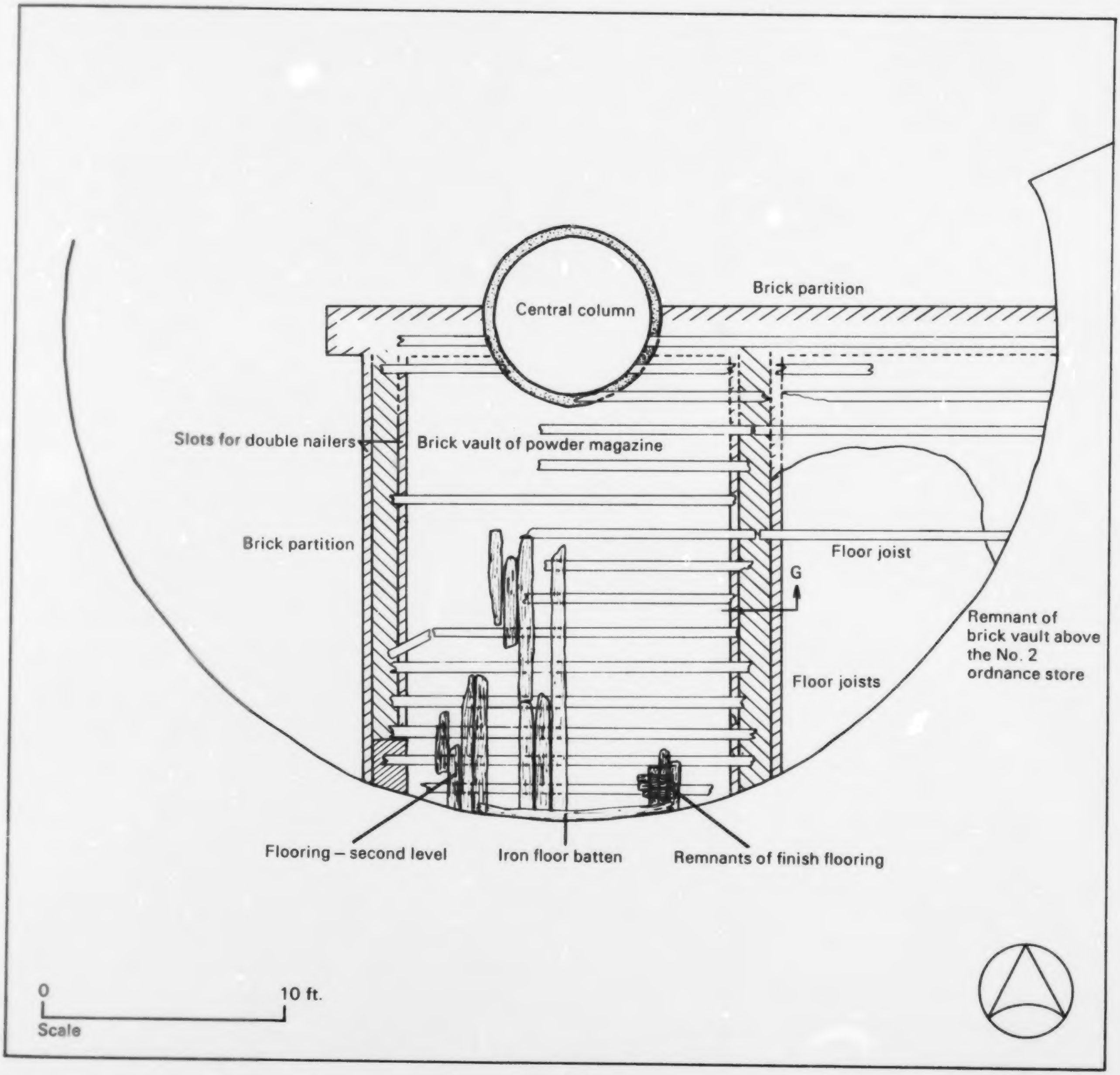
This feature (Fig. 28) was the most important in terms of preservation, because the vault was still sound and much of the floor that had rested atop it remained.

The floor joists in this area ran parallel to those on the ground level, in an east-west direction. These joists were not of the same dimensions as those found below and they had been hewn to fit the curvature of the vault. Another notable feature of the joists was that many of them had been drilled for 1½ in. holes spaced about 7½ in. apart. This spacing, however, was not consistent. The function these holes served was not determined, but it was reasonably certain that they were not drilled to hold pegs for retaining the floor: the extensive use of nails and the lack of any dowels precluded that assumption. The joists (Fig. 28) did not extend out over the barracks stores or over the No. 2 ordnance store, but butted the separate joists that did. This arrangement was noted in two instances and was further substantiated by the occurrence of double nailers on each side of the magazine walls (Figs. 29, 30).

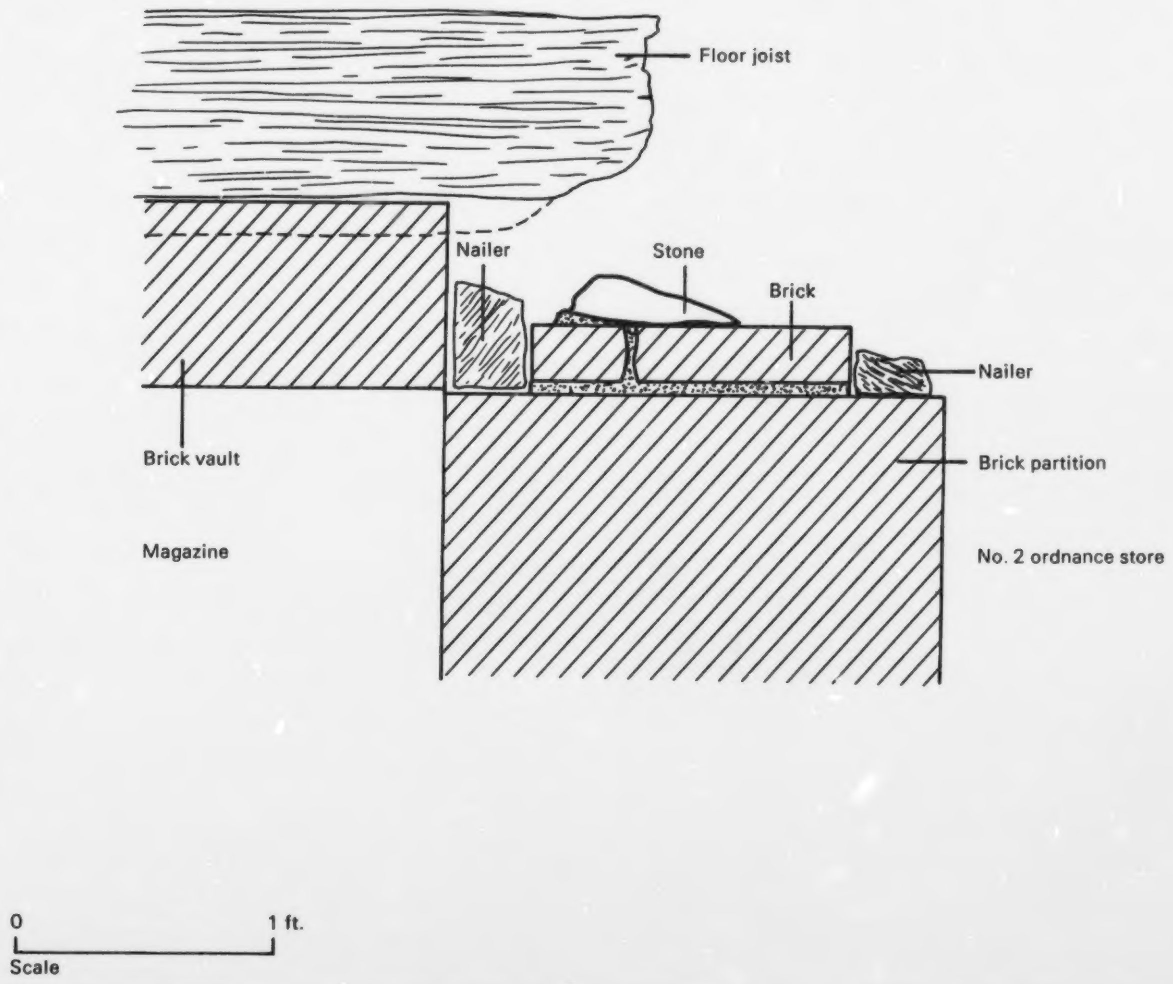
27 Interior of the pantry after excavation. Note the top of the cast-iron latrine pipe between the scale and the photoboard.



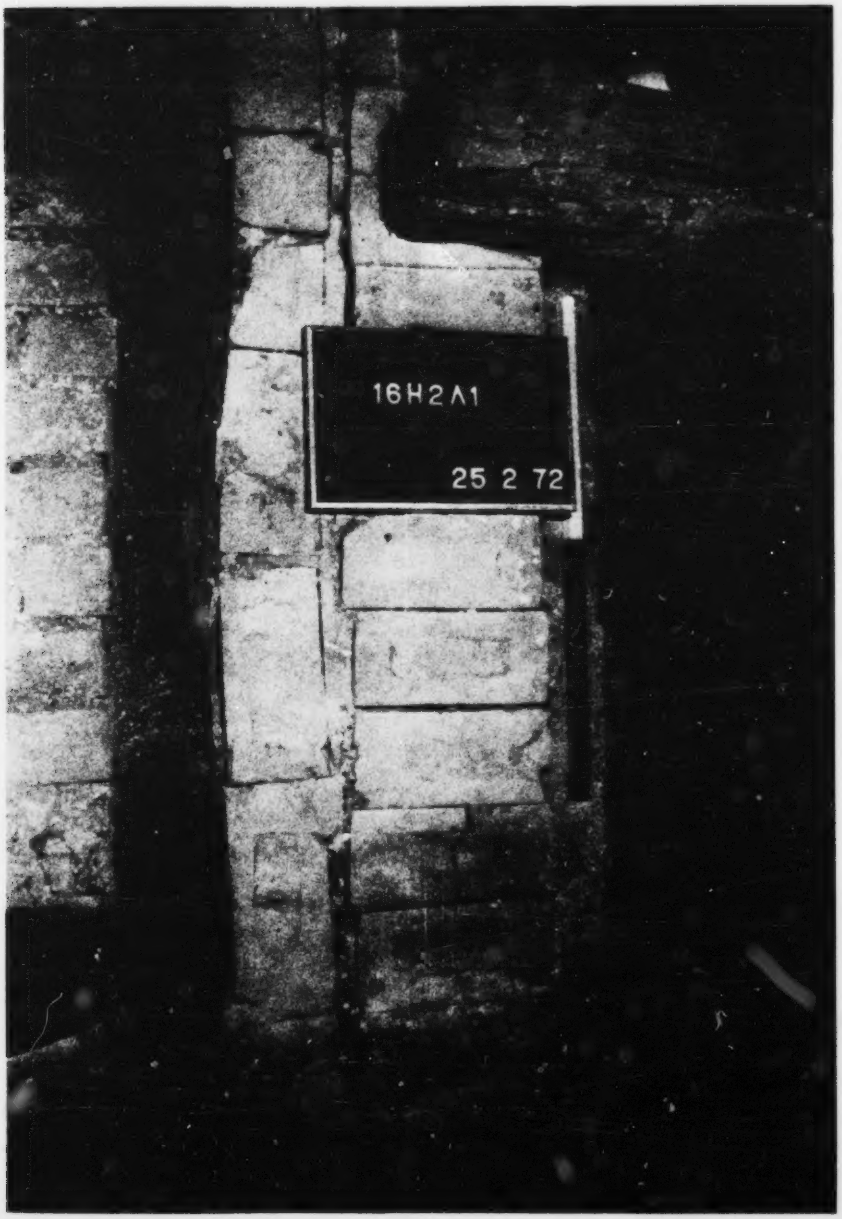
28 Plan of the magazine roof showing floor joist arrangement and existing flooring.



29 Cross-section of the top of the partition wall illustrating the double nailer arrangement for the floor joists of the magazine roof floor and the floor of the room above the No. 2 ordnance store, detail G.



3 Double nailer arrangement on the roof of the magazine. A small fragment of wooden nailer was found beneath the joist in the upper right corner of the photograph. View is toward the east. Scale, 2 ft.



Atop the floor joists were remnants of the sub-flooring and some evidence was found to support the hypothesis that this level had a finished floor. Curved sections of the iron floor batten were also found in place along the perimeter of the wall.

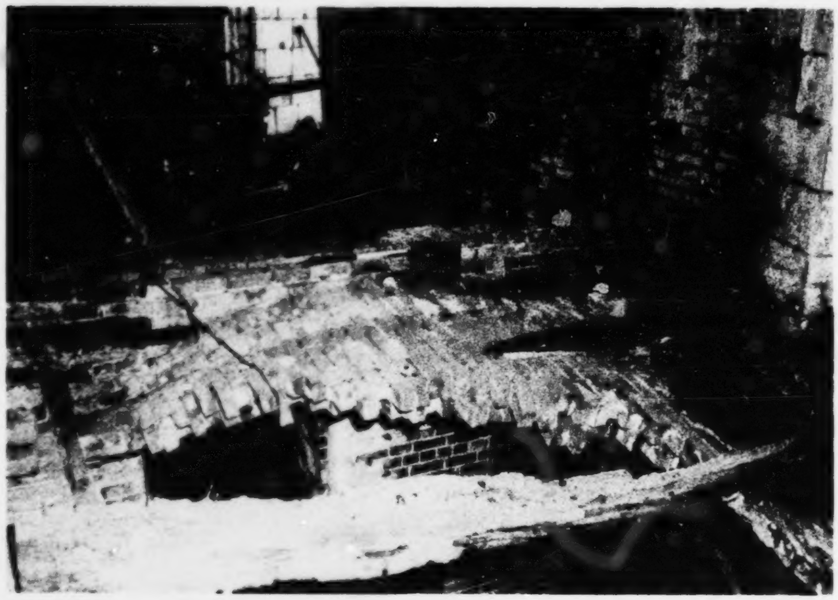
The Officer's Quarters

The only other area of the second level that remained at least partially intact was that which had rested atop the brick vault above the No. 2 ordnance store. This vault differed from that of the magazine in that it curved in an opposite direction, that is, east and west. In this case the floor joists were also cut to receive the curve of the vault, and in those areas where the curve exceeded the thickness of the joist, brick pads were used beneath the unsupported portions of the joist (Fig. 31). This vault was in very poor condition and a great deal of it had already collapsed into the room below. The support system is shown in Figure 32.

The officer's quarters was a wedge-shaped room in the fourth quadrant of the tower and centred on the first window east of the entrance. The exact location of this room could be ascertained by several features. First, four of the corner iron floor batten brackets were found in place. Figure 33 shows the two that lay on either side of the northern partition of the room. The other two were found at their locations where the wall partitions neared the centre of the structure. Second, there still remained discolourations on the ceiling caused by the wall partitions and third, the

31 The vault above No. 2 ordnance store as excavated. Note how joists are supported by brick pads and cut to fit the curvature of the vault. View is toward the north. Scale, 2 ft.

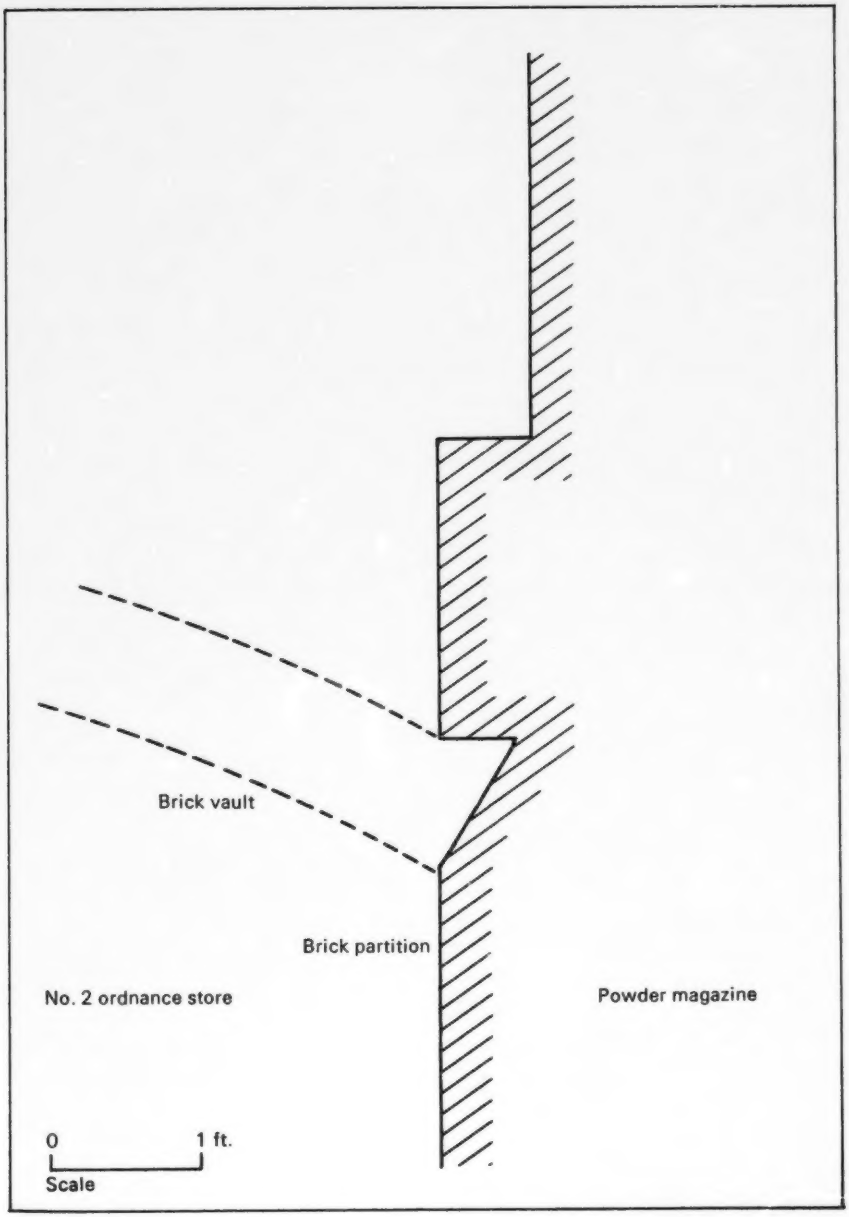
31



33 Iron floor batten corner brackets. The northern partition wall of the officer's quarters separated these two brackets. View is from the west.

33

32 The support system for the brick vault above the No. 2 ordnance store.



position of the stove pipe hole. All of this confirms the officer's quarters layout as presented in Figure 2.

The points at which the joists butted the interior face of the exterior wall of the tower differed from those which were found on the ground level. In this instance the brick work was slotted to receive the joists. This circumstance occurred around the entire perimeter of the wall. A 5⅞ in. ledge had also been cut in the central stone column to receive the joists which intersected it. The last three joists on the eastern side of the column were continuous, extending from the outer wall to the column. Because of the state of collapse and deterioration, it was impossible to determine this relationship on the western side of the column.

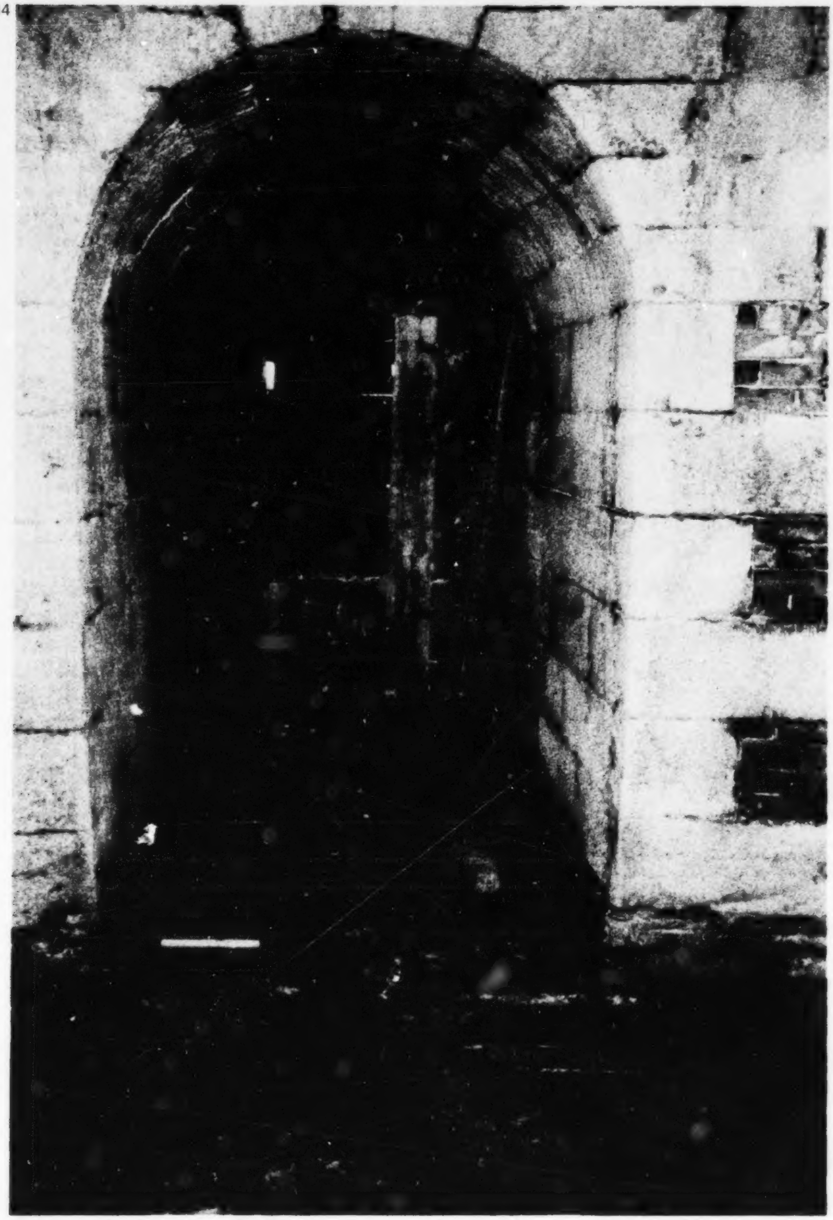
The room on the western side of the column, the barracks store, was not vaulted and all of the joists had collapsed to the ground level. Since this room did not have a vault, it was difficult to determine the joist support system. It was assumed that the joists spanned the distance between the outer wall and the western wall of the magazine and were supported only at their ends by the aforementioned walls. There was no evidence of a nailer or wooden load-bearing member anywhere along the outer wall perimeter.

The rest of the floor that had constituted the soldiers' barracks had collapsed to the ground floor. Some artifacts, mostly hardware, could be attributed to this level.

34 Second level window after excavation. The window opening is surrounded by a wooden frame, much of which had fallen away. The horizontal beams on the floor are joists for the 32-pounder carronade platform. View is toward the east.

35 Exterior shutters of second level window. View is toward the southwest.

34



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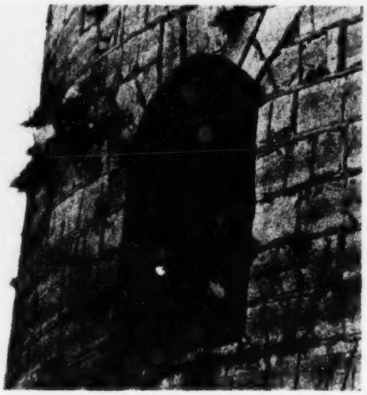


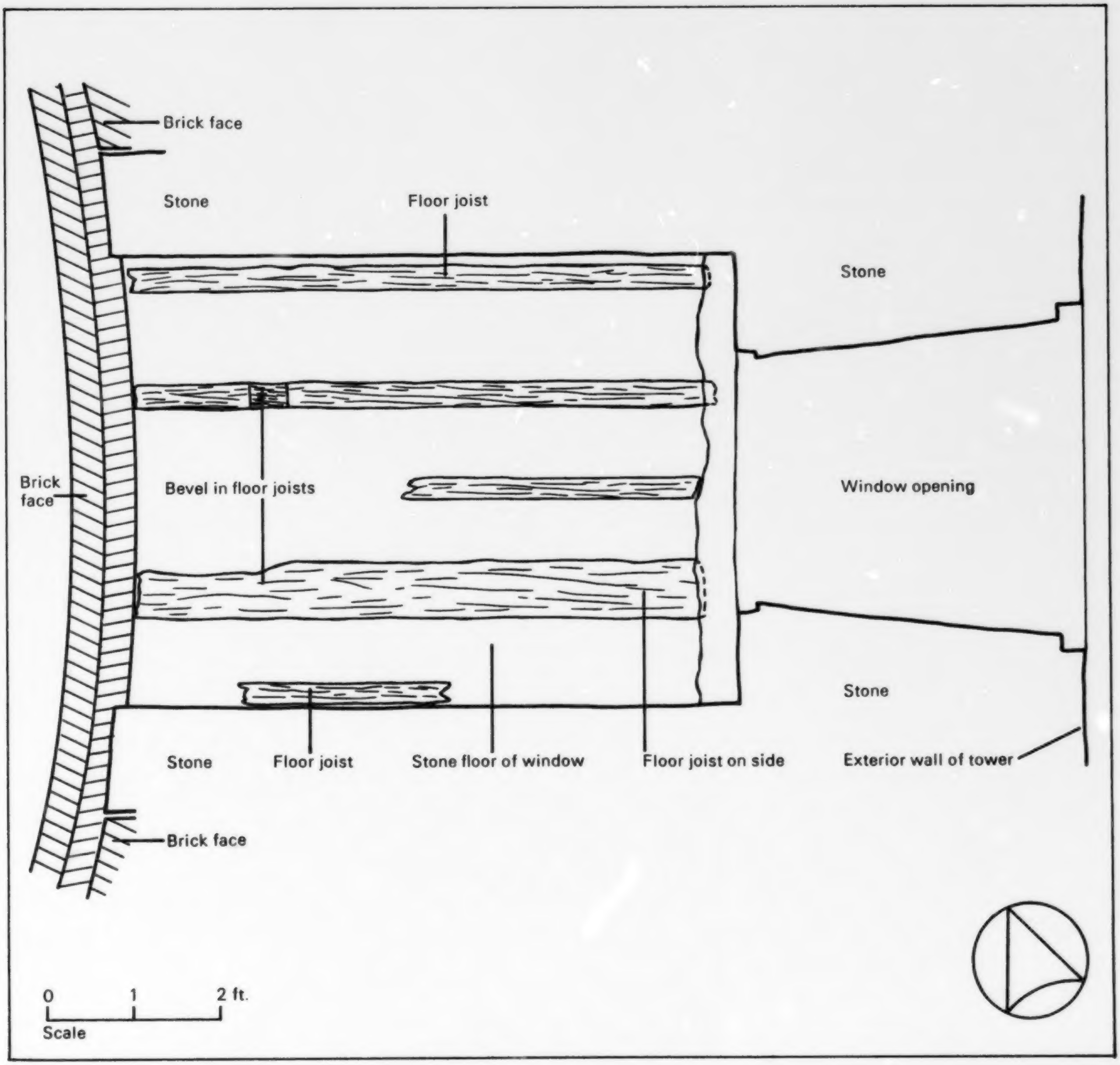
Second Level Windows

There were three windows on the second level and Figure 34 is a photograph of one of these prior to excavation. These windows were large enough to house a 32-pounder carronade and closed with a double shutter arrangement. The outer shutter (Fig. 35) was made of sheet iron and hinged to the outer side of the tower wall, and each of the shutter leaves had a small rectangular opening. Behind this was a wooden shutter which opened inward. Most of these shutter leaves were present inside the tower, but for the most part the jambs had become separated from the wall and had collapsed inward.

Only the first window east of the entrance was excavated completely because the ground was frozen in the windows and excavation destroyed more structural data than it provided. Figure 36 is a diagram of this window and how the floor joists were laid. One notable feature of the second and fourth joists was that they had been cut and bevelled. The reason for this is unknown but these

6 Plan of second level window after excavation. Note the manner in which two of the floor joists were bevelled.

6



notches may bear some relation to the types of gun carriages used for the carronades. Attempts were made to excavate the other windows, but these attempts were discontinued when frozen debris was encountered. During these excavations no other floor joists were uncovered. There was also no evidence of flooring found in the window, but the iron floor batten found throughout the rest of the site was in place below the opening of the window. The interior of the window was faced with cut stones which were used to tie the window into the facing brick of the interior wall surface. The use of dressed masonry around doorways, windows and vents in the brick face of the interior of the exterior wall pre-dominated throughout the structure.

Boiler

On the second level between the second and third windows was the tower's boiler and evidence of its firebox (Fig. 37). This feature was cast iron and was described in the following manner by Lavell (1936: 174):

> *When required, the water was brought by a hand pump to the main floor where the cooking apparatus was situated. For a siege everything was designed to meet the most extreme conditions. Two huge cauldrons, set on top of a firebox, were placed in a recess in the stonework, and the steam from the cauldrons was forced into pipes which entered the wall to be recondensed for further use.*

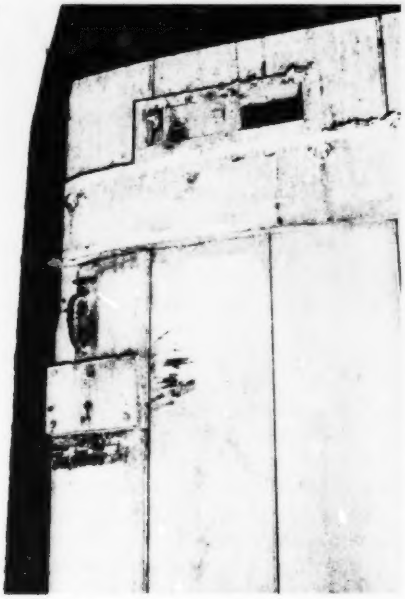
37 Boiler on second level prior to excavation. The boiler was the cast-iron pot beneath which was the firebox that had fallen into the room below. Above the pot was an iron pipe which fed water to the boiler. View is from the east.

37

8 Latrine bowl in third level latrine A. The bowl was of cast iron and was reached by walking down three steps. View is from the east.

39 Door to latrine B. The doors were curved to conform to the curvature of the parapet wall. View is from the east.

40 Rear view of the latrine door illustrating door lock, thumb latch and small sliding door at the top of the door. Below the lock was a sliding bolt. The lumber in the door was hand beaded. View is from the west.



The Market Shoal tower differed from this general description in that it had only one cauldron. A large pipe led into the wall from this cauldron but no outlets were noted.

The Hand Pump

The niche for the hand pump was located immediately to the west of the entrance. The pump itself was absent, but the plumbing was still in place. The source of water for this pump is uncertain because the planned cistern shown in Figure 2 was apparently not built. It is probable that the pump connected directly to the river, but, again, this is conjecture.

Third Level Stairwell

This set of stairs was on the southern side of the tower at its thickest part, 15 ft. It exited between the southwestern and southeastern 32-pounders on the gun platform. The entrance on the second level did not have a hinged closure, but the exit on the third level did and this was held in place by a very large latch hook. The stairs were cut limestone.

The Third Level

The third level was the action level or gun platform. On this level on rotating barbette carriages were three 32-pounders overlooking the harbour. Covering the gun platform was a wooden roof that could be cleared away in time of action. This platform is currently covered by a recently added wooden roof.

At the time of excavation the gun platform had already been cleaned of the dung that had covered it and of course contained none of the other debris found in the lower levels. The only areas investigated on this level were the two latrines that were recessed into the southwestern parapet wall.

Latrines

The two latrines were located side by side and were identical in almost all respects. The fill in the latrine area was undifferentiated pigeon dung and no stratigraphy was apparent. The latrines were separated by a brick-filled wooden partition and the lumber used to cover the brick work was hand beaded. The toilets themselves were sunk below the floor level of the gun platform and were approached by three steps that led down from that level. The toilets consisted of wooden seats placed above a cast iron bowl (Fig. 38) that funnelled the waste into a central pipe that dropped to the water underneath the tower. This pipe was the one mentioned in the discussion of the pantry. Fragments of the toilet seat for the southernmost toilet were found, but none for the other latrine were recovered. Both latrine openings had doors, although the door of the northern latrine had been torn from its hinges. The other door was in place and can be seen in Figure 39. This door was held closed by a thumb latch and had a small sliding wooden window cover over the window (Fig. 40). The doors themselves were curved to match the curvature of the parapet wall.

Artifacts

The artifact collection from the tower was small and consisted mostly of iron building hardware. The ceramics, glass and miscellaneous groups of material were very poorly represented. The building hardware in the course of time had fallen into the debris as the doors, window mouldings and other wooden features had rotted and pulled away from the stone wall. The other large category of metal artifacts found was ordinance that had been left behind when the tower was abandoned. Because the tower stood open to the public and the weather, and because of the undifferentiated stratigraphy, artifact counts were not considered pertinent. This was especially true of nails, and no systematic effort was made to collect all of the nails in the building. To have done so would have destroyed other important features such as the remaining flooring and the aperture mouldings. A sample of the different types of nails used was taken, however. Although object counts were made, it had been the author's intention to treat these artifacts in a qualitative rather than a quantitative manner as a result of the feeling that the sample was not large enough or representative enough to justify statistical treatment.

Ceramics

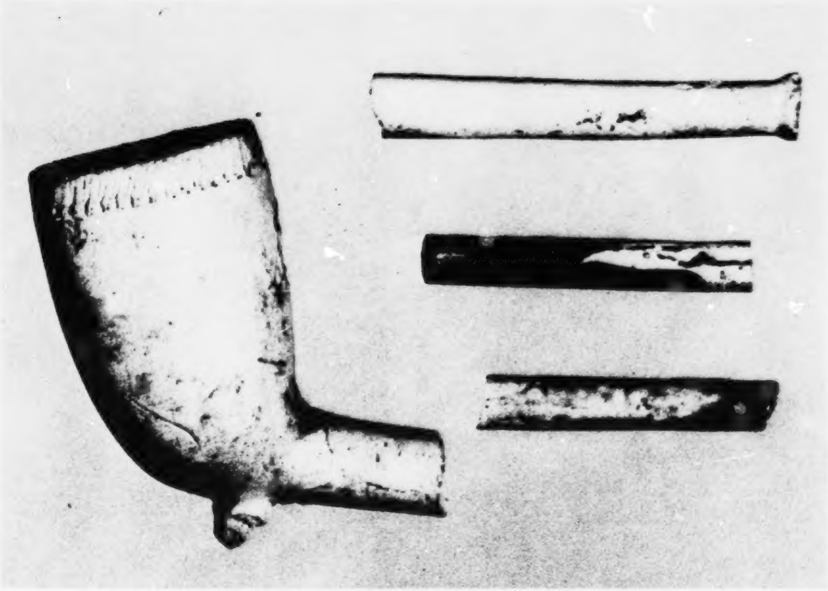
The ceramic collection represented 11 vessels and none of these were very distinctive. All could be dated to the latter part of the 19th century or the early 20th century and they consisted of the following:

Porcelain egg cups	2
Stoneware beer bottle with the inscription "Fisher and Thorton, Kingston", near base	1
Plain, widemouth, partially vitrified storage jar	1
Plain, partially vitrified cup with wheat straw motif moulded on rim	1
Plain saucer same as cup	1
Plain, partially vitrified saucer, no motif	1
Small bowl, plain, partially vitrified	1
Small plate, white earthenware paste, no decoration	1
Black transfer printed cup	1
Tea pot lid with treacle glaze common to many New England potteries, e.g., Bennington	1
Small porcelain, Siamese cat figurine	1
Miniature plate, cup and saucer of porcelain from child's tea set	3

Because of the small size of the collection it would be difficult to say that it represented garrison life. What was more likely was that it represented the people who lived in the tower after the garrison was removed and the tower abandoned by the military forces.

41 Clay pipe fragments excavated from the Shoal tower.

1



42 Marred maker's mark on the side of the pipe bowl.

42

Pipes

The pipe fragments from the Market Shoal tower included only 12 stem fragments and one pipe bowl. Of the pieces that had identifiable marks all could be dated to the mid-19th century. Only three pipestem fragments carried any indication of maker's marks and two of these were the mark of William Murray, Glasgow. Murray was known to have been making pipes in that city between the years 1833 and 1861 (Walker 1971: 25). The other pipe stem was marked Dixon, representing a pipe manufacturer in Montreal between the years 1847 and 1894 (Walker 1971: 25). Three of the stems had traces of green or yellow glaze around the mouthpieces, a practice which was popular during the 19th century, and another had a flattened tip or mouthpiece (Fig. 41). This effect was quite similar to the type of tip used on briar pipes which had become popular during the latter part of the 19th century (Walker 1971: 31). The only bowl found had its distinguishing characteristics marred and was unable to provide any clues as to its place or date of origin.

Coins

Only two coins were found, one a copper halfpenny and the other a copper penny (Figs. 43 and 44). Both were minted by the Bank of Upper Canada in 1857. The Bank of Upper Canada was formed in Toronto in 1820 and in 1849 it became the government bank after the burning of the Parliament buildings in Montreal. It was also given the privilege of issuing copper coins, but during the financial crisis of 1867-68 its operations were suspended and it was unable to reorganize (Breton 1894: 116).

Buttons

Only six buttons were found in the excavation. Five of these were white, felspathic buttons of the type found on shirts (Fig. 45). The sixth was a brass Canadian militia button (Fig. 47). Embossed on the face of this button is a crown over three fieldpieces with the words "Canada Militia" encircling the edge. On the reverse side of the button are stamped the words "Superior Quality" and the letters "P P B". All parts of the button including the face, back and eye are made of brass. The face is domed and folded around the edge of the back and the eye is a U-shaped loop riveted through the back of the button. This type of button, described by Emilio (1911: 161), was worn by the Canadian Militia, Army Artillery between the years 1890 and 1896, but Emilio's description varies from that of the button found in that he noted the maker as being P. Tait Limerick. Associated with the buttons were two button sticks or button cleaning guards (Fig. 46).

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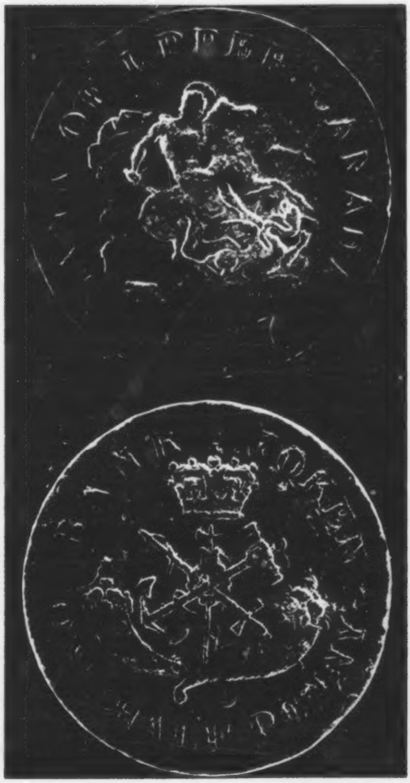
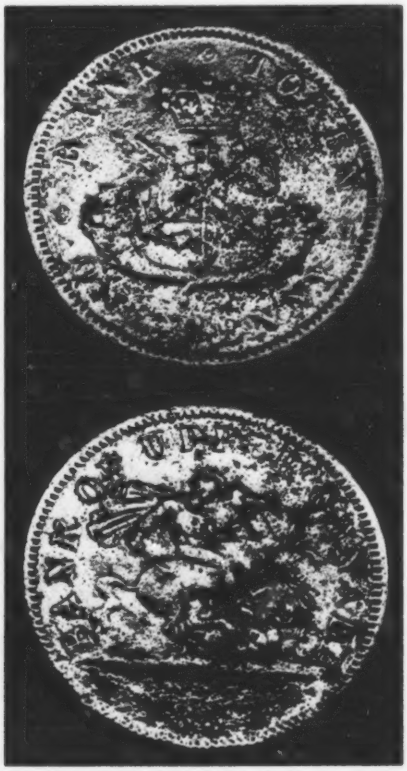


43 Obverse and reverse sides of 1857 Canadian halfpenny.

44



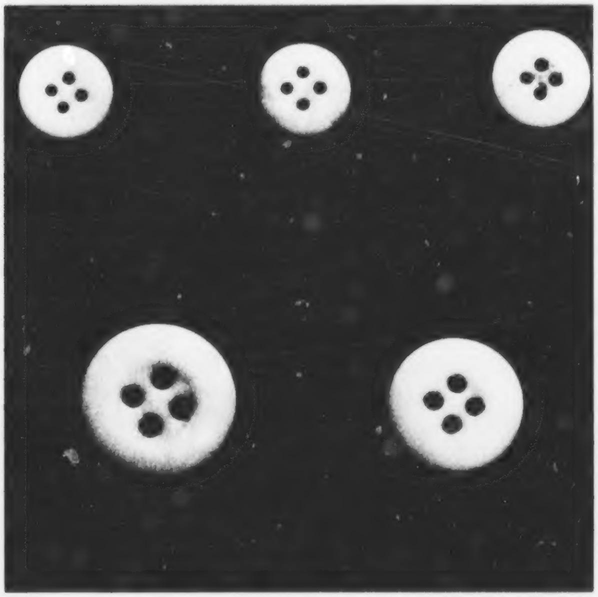
44 Obverse and reverse sides of 1857 Canadian penny.

45 Five white feldspathic buttons.

46 British army button "sticks" used as guards to prevent cleaning agent from getting on uniforms.

47 Reverse and obverse sides of Canadian militia button used by the militia during the mid-1890s.

45



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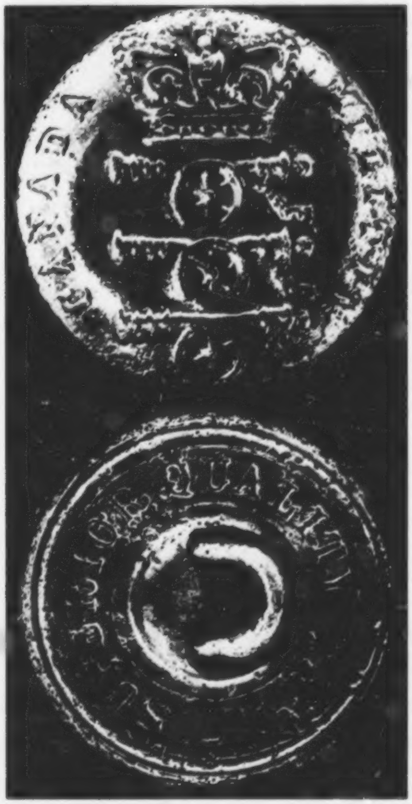

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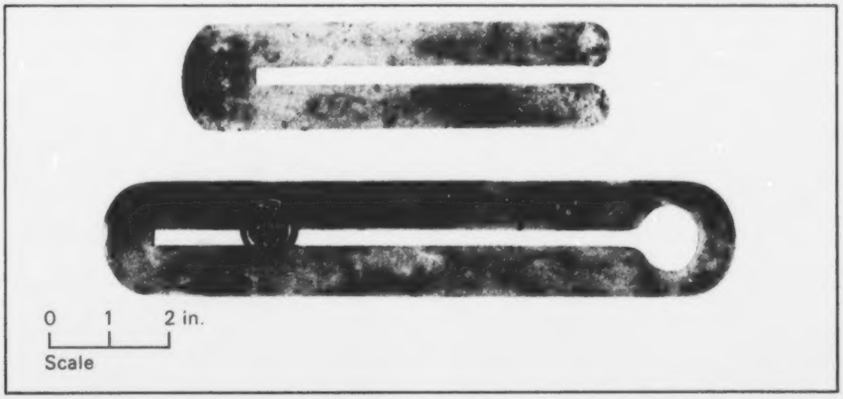


These brass guards were slid between the tunic and the button to protect the tunic while the button was being cleaned. Both of the sticks are made of brass, but one is open-ended while the other is closed. On one side of the open-ended button stick is stamped the date 1811 and the other side bears the stamp of the manufacturers "Smith & Wright, Button Ornament Manufacturers, Contractors, Birmingham." The closed end button stick bears no manufacturer's stamp, just the stamped inscription "J (broad arrow) II". Button sticks were discontinued with the recent introduction of non-tarnish buttons.

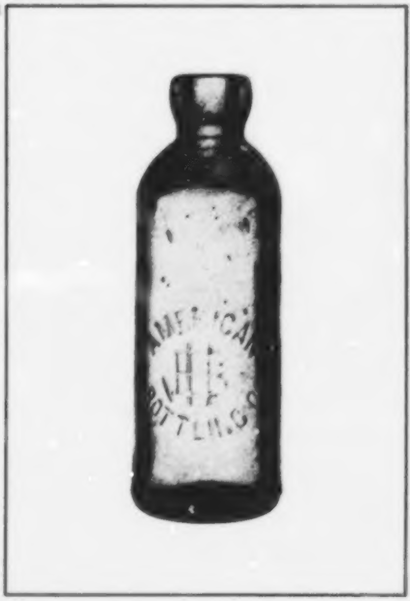
Glass

The glass artifact collection was not much larger than that of the ceramics, numbering 16 pieces. Of these 16, three were liquor bottles, three were druggist's bottles, two were beverage bottles, three were lighting devices and five were table glass. This object count was based upon identifiable fragments and does not necessarily represent whole objects.

Liquor Bottles

Of the three liquor bottles found, two were olive-green and had been turn moulded and the other was made of a brown glass that carried stippling and part of an embossed design. The two olive-green bottles date from a post-1870 period (Toulouse 1969: 532). The brown stippled bottle looks to have been machine made (Jones, pers. com.) and probably dates from the 20th century.

48



48 Beverage bottle of aquamarine glass employing Hutchinson stopper made for American Bottling Company.

Beverage Bottles

Two aquamarine beverage bottles were recovered from the excavation, but one was very fragmented and all that could be determined about it was that it had been made in a two-piece mould. The other (Fig. 48) was made for the American Bottling Company and used the Hutchison stopper as a closure device. This stopper was patented in 1879 and discontinued in 1912 (Riley 1958: 97-98).

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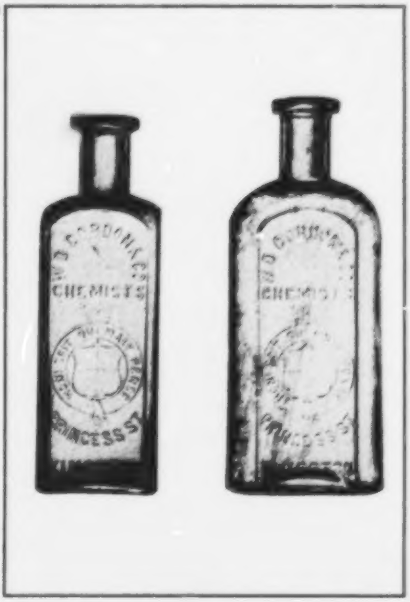


49 Two druggists' bottles made by Whitall, Tatum and Company for W. D. Gordon, chemist, Princess Street, Kingston. The bottle on the left is a "French Square" and that on the right is a "Philadelphia Oval." Both are from the same provenience.

Druggist's Bottles

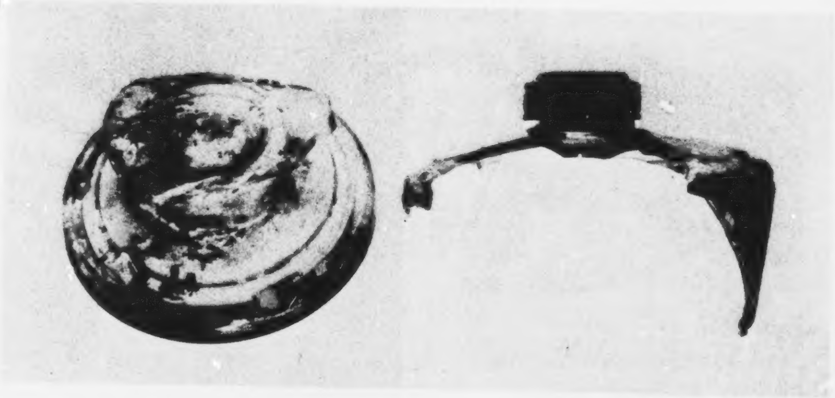
Three druggists bottles were recovered from the excavation. Two of these (Fig. 49) were complete and the third was represented by the neck and lip. All three of these bottles had the type of lip known as the "Prescription Lip" which was illustrated in the 1897 annual catalogue of Whitall, Tatum and Company (1897: 10). The two complete bottles were made by this company for W. D. Gordon and Company, Chemists, located on Princess Street, Kingston. This company appears in the Kingston City directory for the year of 1872, but does not reappear in succeeding years. One of these bottles was an 8-oz. "Philadelphia Oval" (Whitall, Tatum and Company, 1897: 15) and the other was a tall "French Square" of the same capacity (Whitall, Tatum and Company, 1897: 12). The Whitall, Tatum and Company glass manufacturer, whose factories are located in Millville, New Jersey, developed in 1857 out of a series of ownership and partnership changes that began with James Lee in 1806. Beginning as manufacturers of cylinder glass it is now the oldest continuous glassmaking plant in the United States (Toulouse 1971: 544-45).

Lighting Devices
Lighting devices included a lamp chimney, a font for an oil lamp and an oil lamp base with handle (Fig. 50). It was uncertain as to whether or not these had come from the same lamp but it was quite possible. The pressed glass lamp base was circular in shape and unadorned by any decorative motif.

Table Glass
This category included five different patterned pieces, all of which were pressed and date from the latter part of the 19th century. One such pattern was that of the "Bull's Eye Variant" produced in the 1850s and 1870s. This particular piece (Fig. 51) was a goblet and closely fitted the description given by Lee (1960: 154-55). The metal of the glass was heavy and there were six bull's eyes tapering down into an hexagonal stem, but the stem itself was missing as was the foot. The bull's eye pattern was employed by the New England Glass Company and the Boston and Sandwich Glass Company, and Lee (1960: 154-155) states that the variant style was illustrated in an undated cata-

50 Font and base from an oil lamp. These came from the same provenience and may be from the same lamp.

50



51 Goblet of pressed glass with "Bulls Eye Variant" design.

51

logue of Bryce Brothers of Pittsburg, Pennsylvania. The second heavy patterned piece was a small creamer with a flattened sawtooth design. This creamer closely resembled one illustrated by Lee (1960: 202) and is shown in Figure 52. This pattern was also produced from the late 1840s and early 1850s and was illustrated in an undated catalogue of George Duncan and Sons of Pittsburg, Pennsylvania (Lee 1960: 138).

The last glass object of the heavy pressed variety was a small bowl with ribbed sides. This bowl had what appeared to be a ground and polished pontil mark on the base and has not yet been identified (Fig. 53). There were two other pressed glass pieces in the collection, but these were much lighter in weight than the aforementioned vessels. The first of these was represented by a small rim fragment that carried a section of a decorative motif on the interior surface. This was probably a lid to a sugar dish (Fig. 54) and the decorative motif was that of the "Cabbage Rose" (Lee 1960: 373-4). This pattern was popular in the late 1860s, one producer being the Central Glass Company in Wheeling, West Virginia. Another vessel of light weight in pressed glass was a small honey or preserve dish measuring 3½ inches in diameter (Fig. 55). This dish bore the "Bleeding Heart" pattern produced by the King Glass Company of Pittsburg prior to its absorption into the United States Glass Company in 1891. The series bearing this motif was begun in the 1870s (Lee 1960: 399-400). All of these fragments were tested under

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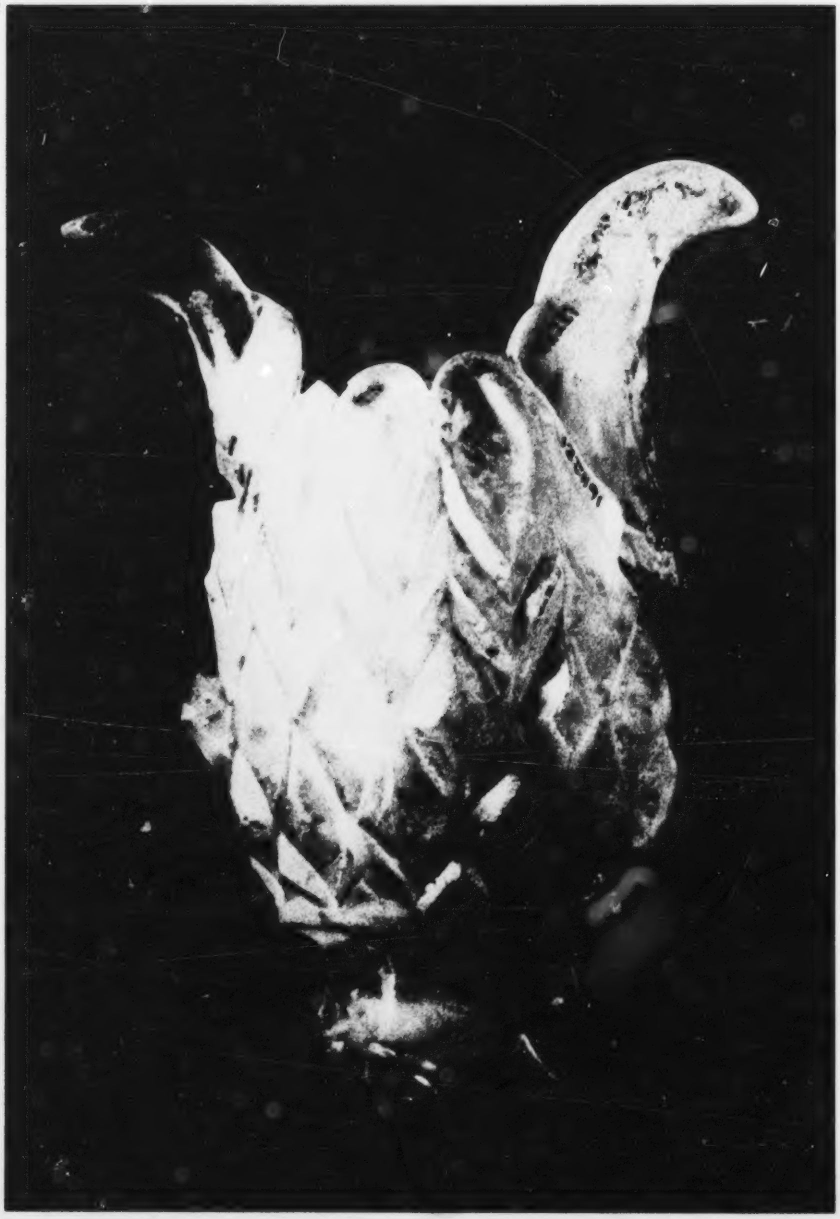

52 Small pressed glass creamer with flattened saw-toothed design.

53 Pressed glass tumbler with ground and polished pontil mark on the base.

54 Pressed glass sugar bowl lid with "Cabbage Rose" design.

55 Small pressed glass honey or preserve dish with a "Bleeding Heart" design.

53

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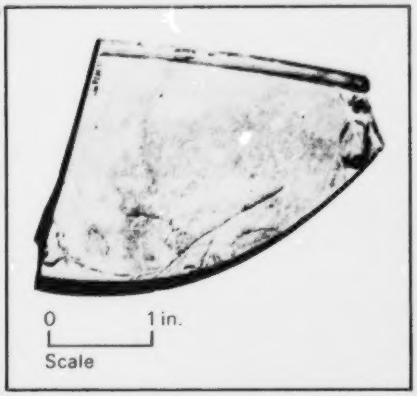

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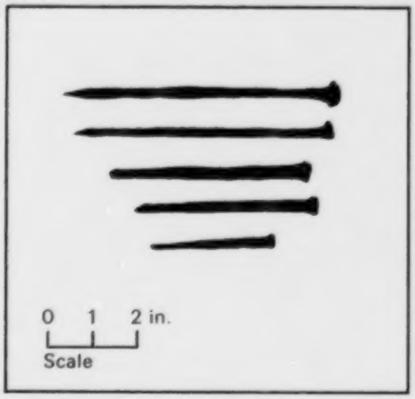
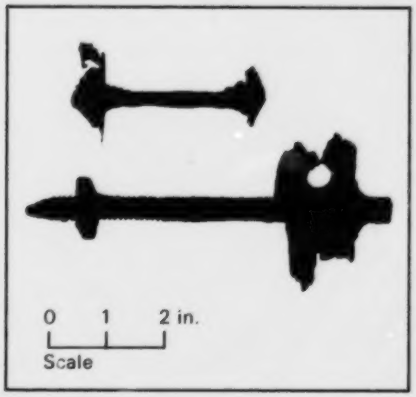
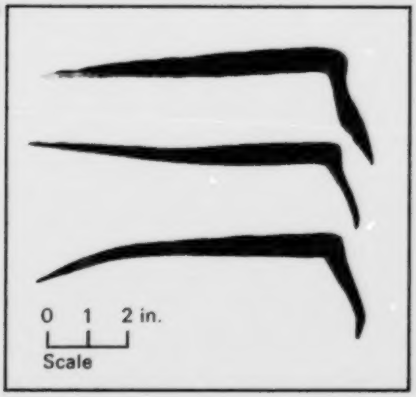


56 Various sizes of nails used in the woodwork of the tower.

57


57 The bolt at the top has been described as a batteau bolt while that at the bottom was used to bind together the laminated wooden doors that were used in the interior passageways of the tower.

58


58 Wrought iron wall anchors used throughout the building to fasten equipment and uniform hangers to the brick walls of the tower.

ultraviolet light and found to contain no lead, indicating that they were made after 1864 when soda glass began to replace lead glass (McKearin & McKearin 1948: 142).

Window Glass

The remaining glass that was found within the tower was that which had been used to glaze the windows of the magazine. This plate glass was found on the window sills and had a thickness of 15/64 in. It is not known where this glass was manufactured, but it was probably cast (Davis 1949: 168-70).

Metal Artifacts

The metal artifacts found constituted the bulk of the artifacts retrieved from the excavation and most of these items were building hardware in the form of nails and wall anchors. Metal artifacts were divided into functional groups: building hardware, ordnance, ordnance hardware, artillery tools and miscellaneous.

Building Hardware

Some mention of the manner and materials with which the tower was constructed have already been made. The major building materials used were limestone and brick. The floors were wooden and the flooring was held in place with wrought nails. These nails (Fig. 56) were for the most part 4 in. or 6 in. in length with a chisel tip and a diamond-shaped head. There were also 5, 4½, 3¾ and 3 in. wrought nails used as well. Some cut nails in lengths of 6, 5, 4 and 3¼ in. were found. The only use noted for these cut nails was in the construction of the wooden window and door mouldings. There were also some wire nails found, but their number was very small and probably did not relate to the original tower construction. Another type of nail found in the construction of the tower was a copper tack 13/16 in. in length. These tacks were used to attach the copper sheathing to the door and window frames of the magazine.

Among the debris a large number of washer-headed bolts were found still retaining wood about their shanks. These bolts measured approximately 6 in. in length and had a shank diameter of 7/16 in. Although none of these bolts were found *in situ* their most probable use was that of binding together the laminated interior doors of the structure. The gap between the washered head and the nut on the threaded end averaged 4⅝ in. although this measurement varied somewhat. An example of this type of bolt can be seen in Figure 57. Along with these bolts a number of threaded screws were found. These screws were used to attach the iron floor battens to the flooring or to attach closure hardware such as shutter fasteners to their mouldings. All of those measured were 2 in. long.

Found in large quantities and still *in situ* were wrought iron wall anchors. These wall anchors (Fig. 58) were approximately 7 in. in length and were used to retain uniform racks in position along the walls. Contrary to the statement made by Lavell concerning the use of non-ferrous metals in the magazine, these anchors were used to retain wall racks in that room.

Another item already discussed but used throughout the tower were iron straps to batten down the flooring. This batten shown in Figures 7 and 62 was made especially for this tower as demonstrated in the fitting of the various corners and angles of the building. Much of this material remained *in situ* and was left there. A number of small door covering vents were found still in place within the tower and an example of these is shown in Figure 63. This particular door had fallen or been removed from its hinges and was found in the debris of the commissariat stores.

The hinges used to swing the closures in the structure were either cast iron, wrought iron or brass. The brass hinges (Fig. 64) were used on the doors and windows of the magazine. The wrought iron hinges varied in size from 2 ft. to 3 ft. strap hinges used to hang the larger doors to the smaller T-shaped hinges used to hang the interior shutters on the second level windows. Very large pintles such as the type shown in Figure 58 were used for the major doors.

The above-mentioned types of building hardware constituted the bulk of that found within the building, although there were several

59 Pintle used on the first set of wooden doors just inside the main entranceway of the tower. The outside doors to the tower were sheet iron and their pintles were fixed in the mortar of the building.

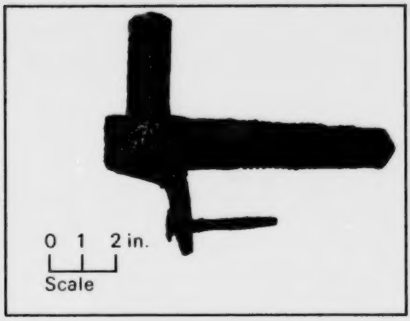
60 Wooden bolt receiver on left and door latch part on right.

61 Copper grate of uncertain use and provenience.

62 Sections of iron floor batten. The top two were cast to fit into the corners of the commissariat while the third piece is just a short piece of straight stock. All are from the same provenience.

63 A hasp used on one of the interior doors and a small vent door used in the barracks stores.

59



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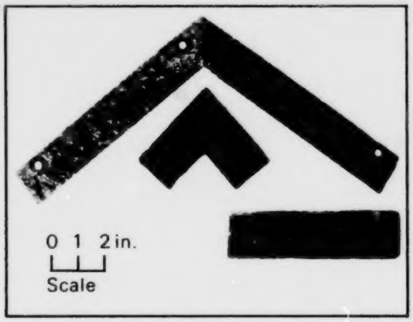

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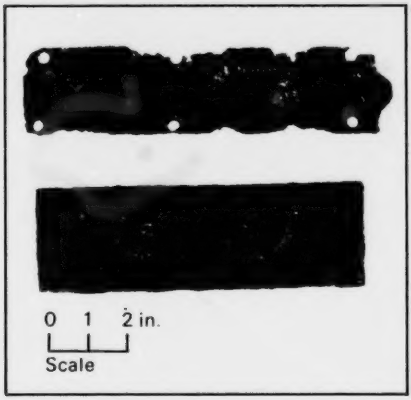

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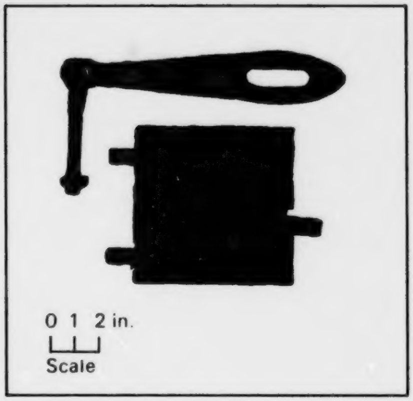

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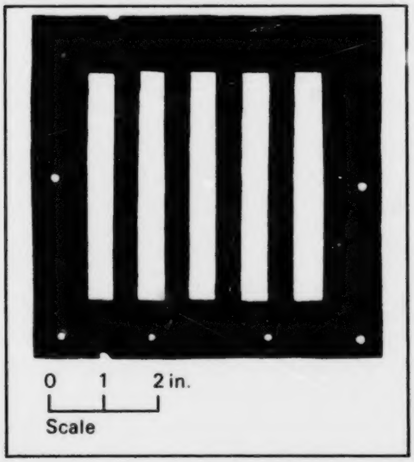


64 Copper window hinge from powder magazine window. View is from the north.
65 Thumb latch, door lock and sliding bolt used to secure the latrine door on latrine B.

64

65

miscellaneous items found. These included an iron ring, several iron and copper floor grates, lock parts, two sliding bolts and a very corroded thumb latch. Thumb latch fixtures were used on the doors of the third level privies as seen in Figure 65, and were probably used on the other doors in the structure.

Ordnance

In the original proposal the Market Shoal tower was designed to carry two 32-pounder smoothbore cannon and one 24-pounder smoothbore cannon on the gun platform and three 32-pounder carronades on the second level. This plan was changed and the tower was ultimately armed with three 32-pounder smoothbore cannon on dwarf traversing carriages on the gun platform. Although the carriages were stamped 1857, this was not the date that the tower was armed but the date that the carriages were manufactured. They were shipped out to Kingston in 1859 and the first two guns were mounted in 1862. The third was installed in 1863. These three guns still remain on their carriages as installed. The first two carronades which fired from the second level windows were installed in 1862 and the final carronade was installed in 1869. The mounting of all these guns was prompted by the Civil War in the United States. The inventory of excavated ordnance was relatively small, consisting of three 32-pound solid shot, 114 small-shot, 14 grape-shot platforms and six iron discs. There was no smallarms equipment found except for one trigger guard (Fig. 69).

The three cast-iron solid shot weighed 31 lb. 7 oz. each. The grape-shot was also cast iron and weighed 2 lb. 12 oz. each and had a uniform diameter of 2¾ in. All of these smaller shot were found in the No. 1 ordnance store as were their spindles and bases. These shot still had fragments of canvas clinging to them and the platforms upon which the shot were stacked consisted of iron discs 7/16 in. thick with a diameter of 6 in. (Fig. 66). The spindles, forge welded to their centres, had a height of 8 in. and the shot was stacked upon these bases three high in rows of three, then wrapped in canvas and bound in place with rope. This type of shot was known as quilted grape-shot and nine of them plus the spindled iron disc weighed 30 lb. (*See* Gooding 1965: 41). The iron discs were also probably used to make a type of grape-shot. This type, described by Manucy (1949: 69), consisted of iron shot set in tiers in a canvas sleeve and separated by iron discs. These discs were 7/16 in. thick and had a diameter of 5 in. There were also some fragments of tin sheeting found in close proximity to these shot which may indicate that tin cannisters were also used to encase the shot. This sheeting was too fragmented to determine its use with certainty, however.

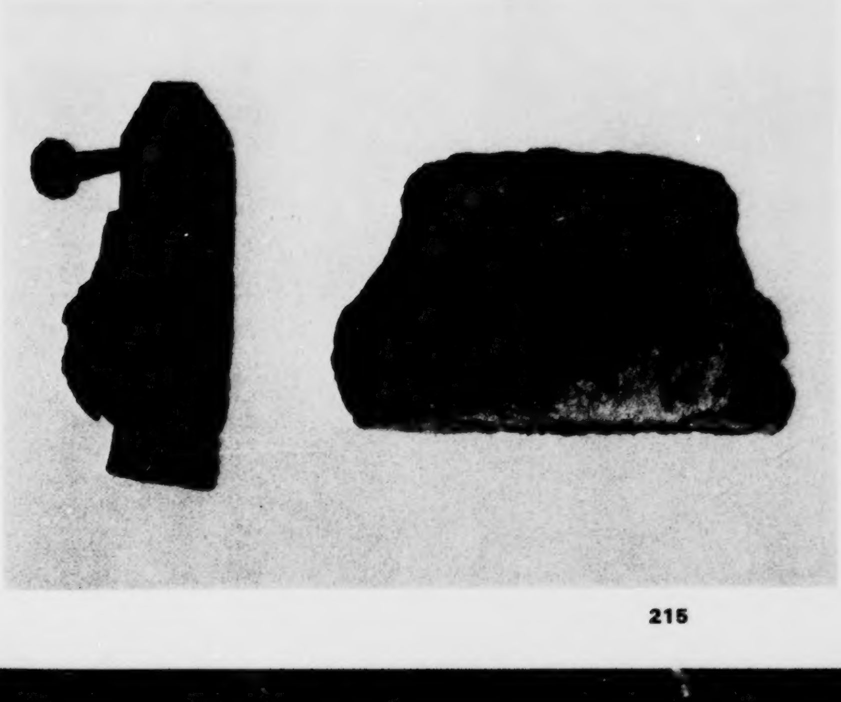
Ordnance Hardware

The hardware associated with the working of the guns was also sparsely represented, consisting of three cleats and one iron skid (Fig. 66) for a gun carriage.

66 Spindle, plate and shot from the No. 1 ordnance store. This shot was used to make quilted grape shot. Remnants of canvas can still be seen clinging to the shot.
67 Gun carriage skid and wooden capstan for gun carriage or a tampon for the mouth of a cannon.

66

67



Artillery Tools
One gunner's pick was found and it is illustrated in Figure 68. A ratchet lever or crank (Fig. 70) for elevating a 32-pounder cannon was also found.

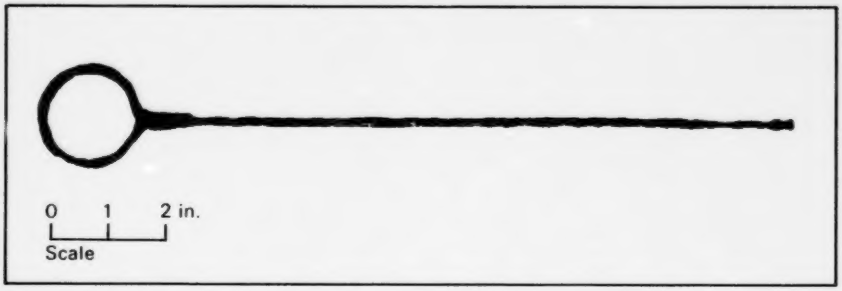
Miscellaneous Metal Artifacts
This category consisted of a mason's chisel, a pulley wheel and some stove parts. Also included in this inventory was an 8-oz. nesting weight (Fig. 72) for an equal arm balance with the inscription "Canada" on the back. Below this was a crown over the letters "VR" over an "A". Two lateen spoons were also recovered, as well as one padlock and lock escutcheon (Figs. 73 and 74). Some cast ornamental iron grill work (Fig. 75) was found, but not enough to determine the pattern employed.

Wooden Artifacts
The wooden artifacts consisted mostly of door and window framing and moulding. The objects included in this collection do not represent any sort of statistical sample of the material available for much of it was left in place for future study. Samples of the mouldings, floor joists and flooring were brought back to Ottawa for analysis toward species identification. It is currently believed that most of the wood used in the construction of the tower was oak. The other wooden objects were a quoin (Fig. 70) used for elevating a 32-pounder cannon or carronade and a wooden capstan for a 32-pounder gun carriage (Fig. 67). Stamped on the end of the quoin was the inscription "32P". WD." (Fig. 71)

68 Gunner's pick. This tool was used by the gunner to clear the vent hole and puncture the powder keg.

69 Trigger guard from some type of smallarm.

68



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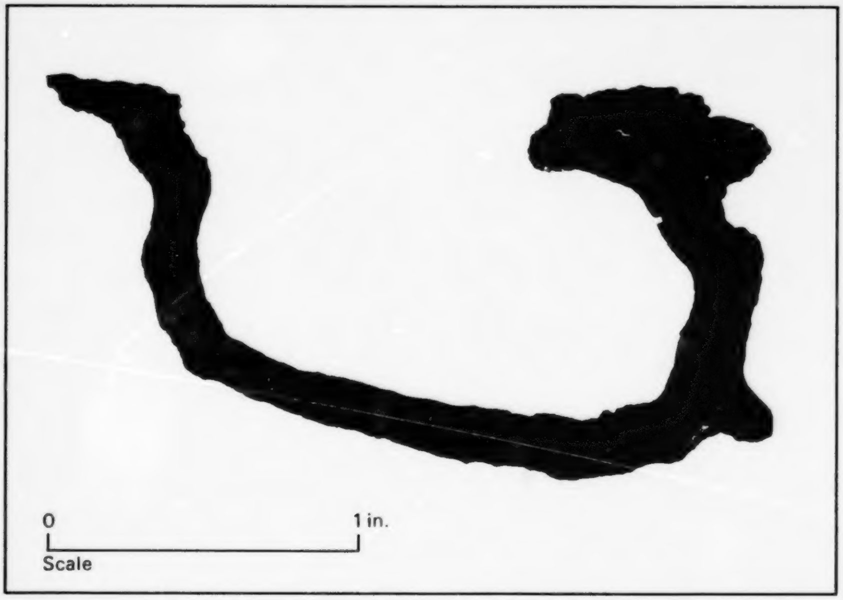
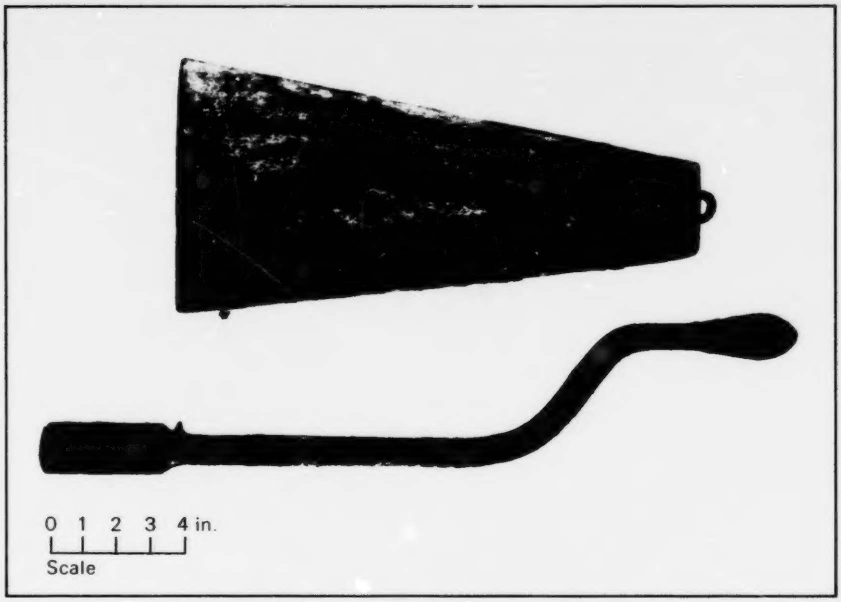


70 Wooden quoin or wedge and wrought-iron crank used for elevating a 32-pounder cannon or carronade.

71 Base of wooden quoin with the stamped inscription "32 P*W [broad arrow] D." The broad arrow is the mark of the British Board of Ordnance.

72 Obverse and reverse sides of an 8-oz. brass scale weight.

70



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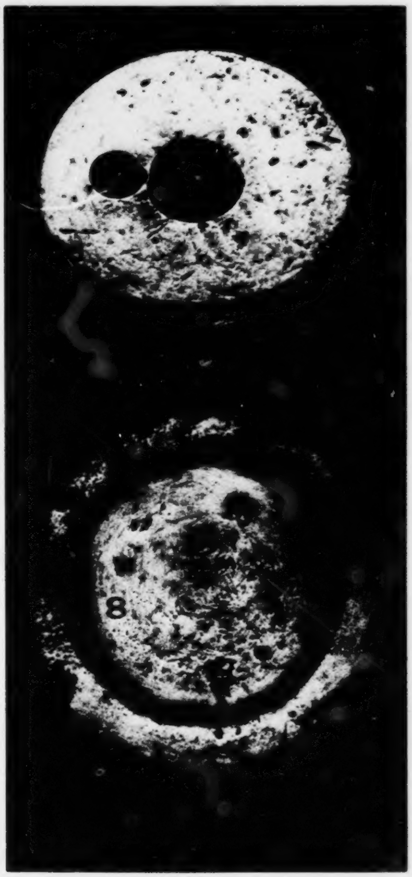

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73 Brass lock escutcheon from the commissariat store.

74 Iron padlock with brass escutcheon plate.

75 Fragments of cast iron grillwork. Not enough of this grill was found to determine the complete pattern and its use is not known.

76 Wooden uniform or equipment hangers. Although the provenience for these particular specimens is unknown, it is certain they were used in all rooms of the tower including the magazine.

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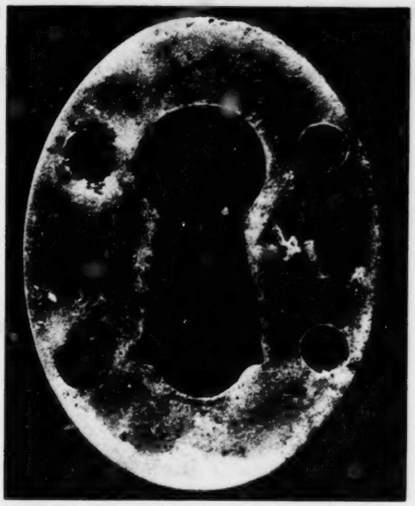

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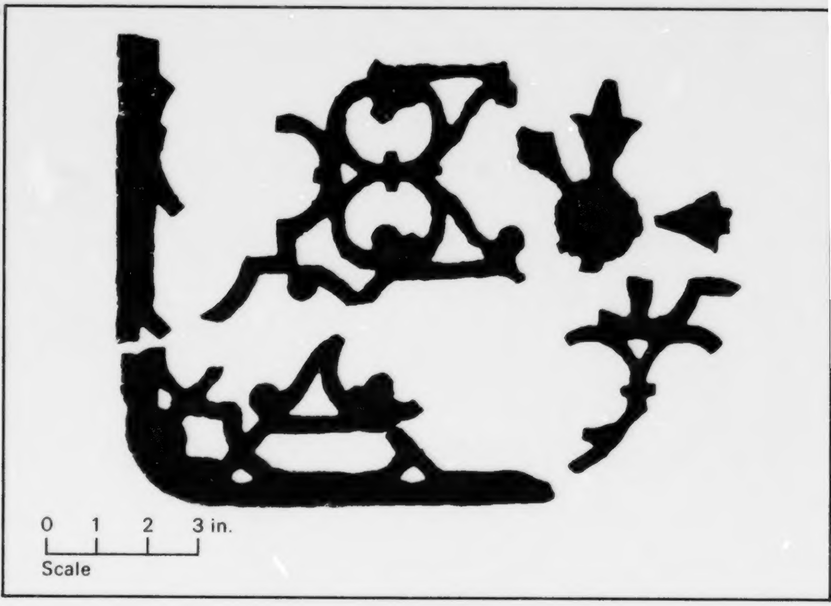

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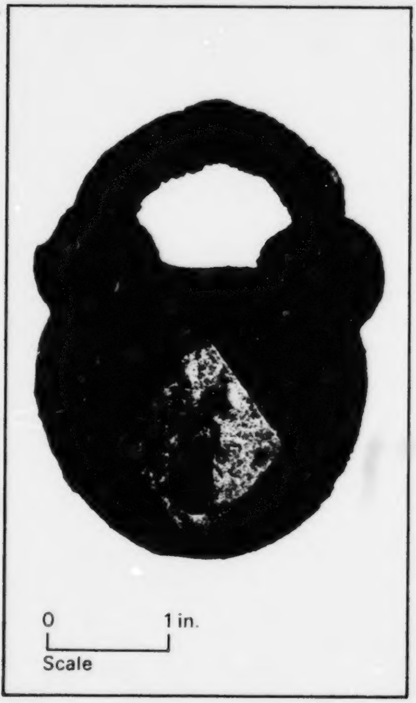

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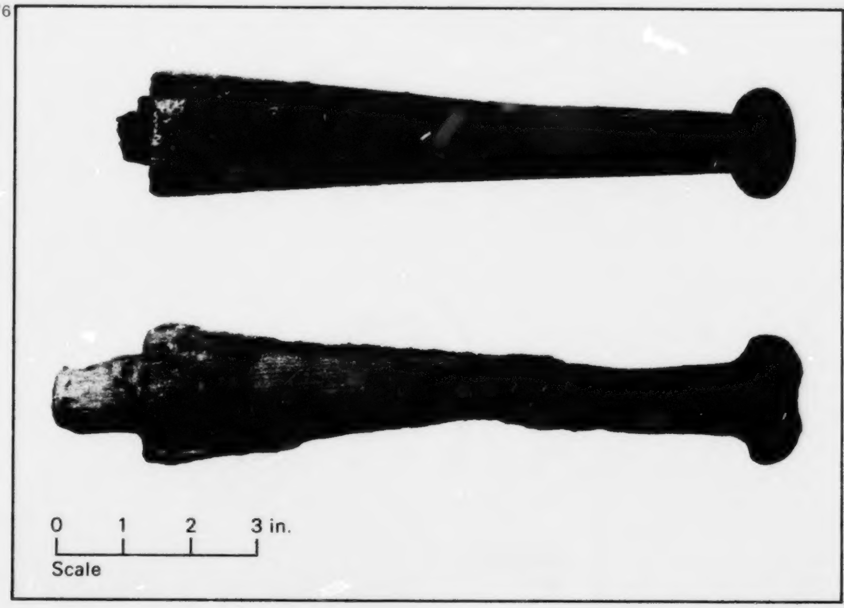


77 Bone toothbrush handle with "N. C. POISON — Kingston" stamped in the handle.
78 Bone gaming die.

Uniform Racks

Aside from the flooring and window moulding the other major use of wood in the tower was in the construction of uniform racks that lined the walls of all the rooms. These racks were held in place by the wall anchors described under metal artifacts, accounting for such a large number of those items. The racks consisted of planks attached to the walls into which were inserted spindles of the type shown in Figure 76. Most of these spindles had rotted at their bases and had collapsed into the debris that filled the tower. All of this woodwork was painted grey.

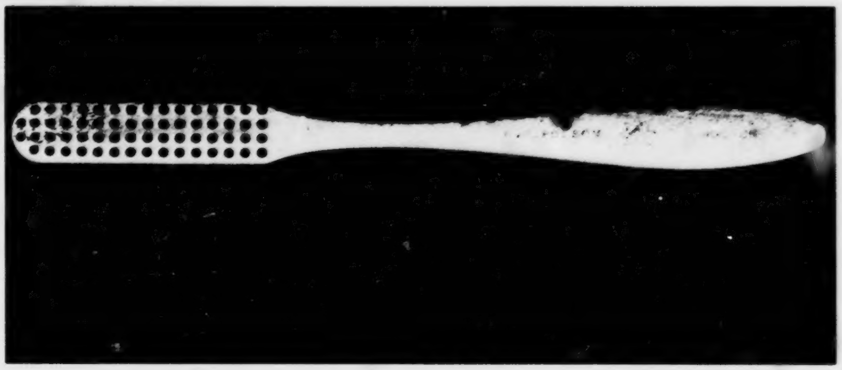
Miscellaneous Wooden Artifacts

Miscellaneous artifacts included one black checker game piece and several pieces of wooden dowel used as uniform hangers or racks.

Bone Artifacts

There were only three bone-handled utensils found in the excavation, a three-pronged fork, a knife and a toothbrush handle (Fig. 77). This toothbrush handle was marked "N. C. POISON – Kingston." There was also a small bone gaming die found (Fig. 78). The rest of the bone consisted of food bones with butcher marks and some skeletal material from small animals that must have gotten into the tower and died there. No analysis has yet been done of this material.

77



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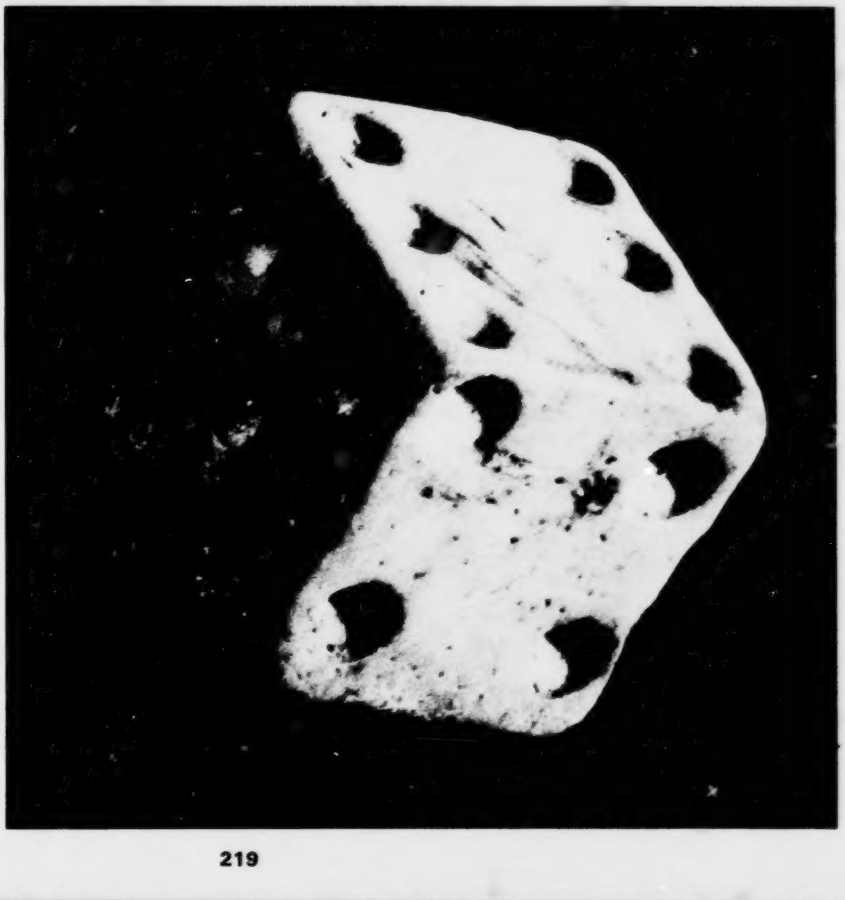


Leather Artifacts

Shoes

Leather shoes were found in the No. 2 ordnance store and in the area of the commissariat store. Only one shoe was found in this latter area, but the total possible number of shoes found was five. This figure is based on the differing types of shoe parts found.

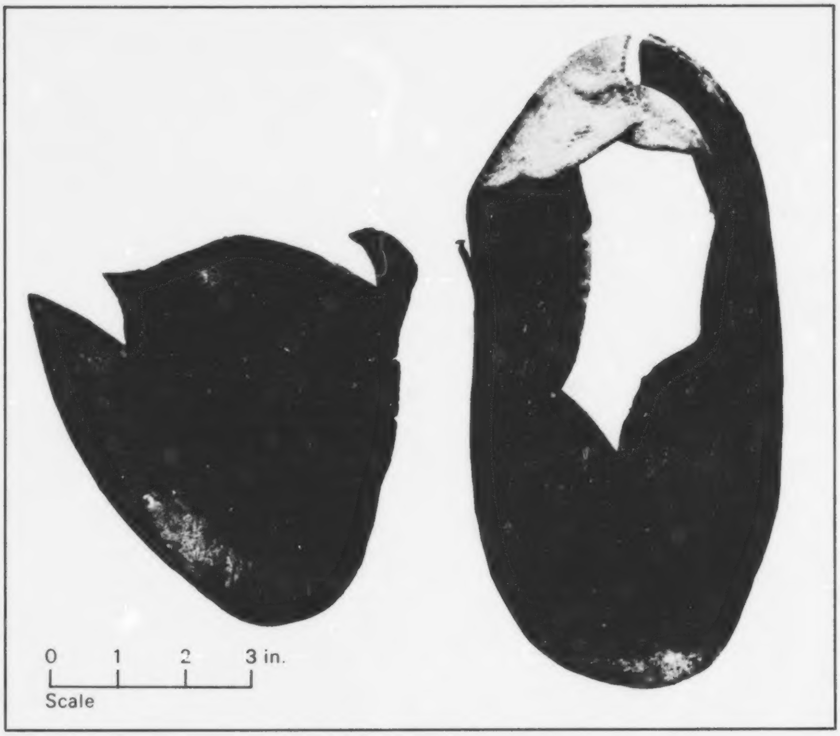
Vamps

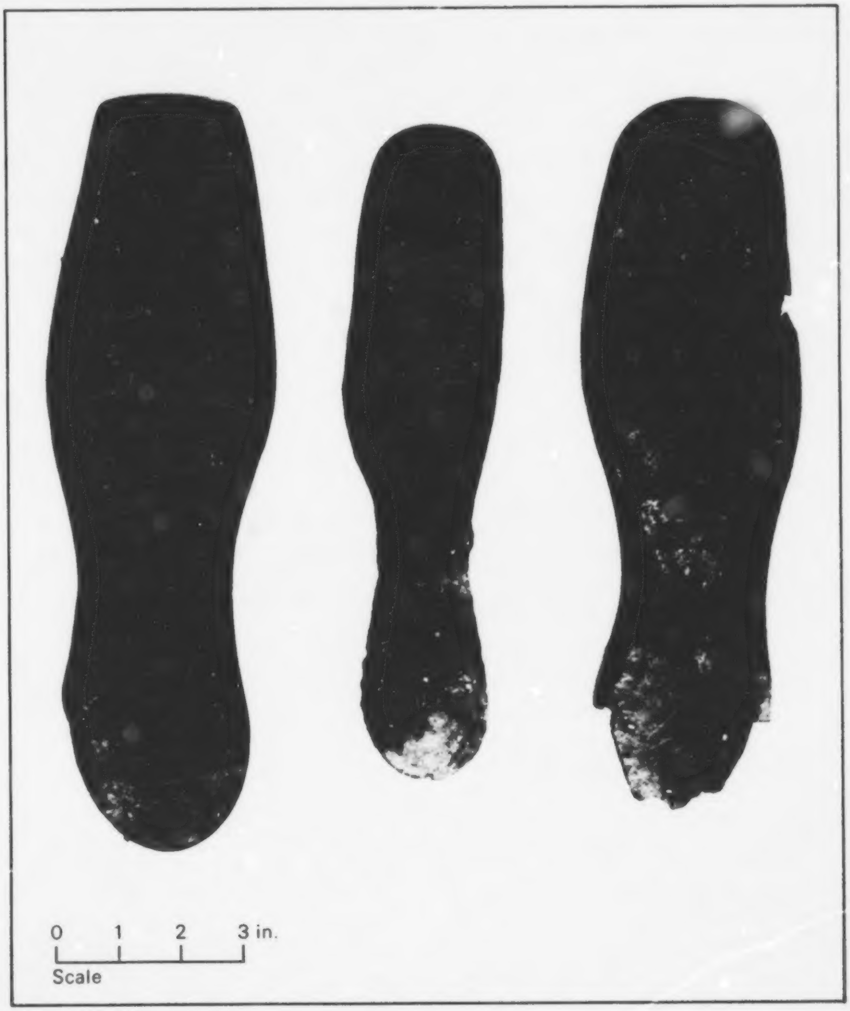
There were three vamps found in the No. 2 ordnance store and all three had been joined to the lower parts of the shoe by use of the MacKay process of stitching patented in 1862 (Anderson 1968: 59). One of these vamps actually had the vamp and quarters combined into one piece joined at the heel, and the quarters were eyed for laces (Fig. 79). The shape of all three vamps was that of a rounded toe.

Quarters

There was only one quarter found and this had been attached to the sole by stitching and had been eyed for laces. This quarter probably belonged to one of the vamps mentioned above.

79 Shoe vamps from the No. 2 ordnance store. The vamp on the left has the letters "I. F." stamped in the leather.





80 Shoe soles from the No. 2 ordnance store. The top two outsoles were attached to the uppers of vamps by the Goodyear Welt process and the bottom outsole was fastened by the MacKay process.
Symbols used in drawings.

Outsoles

There were two blunt-toes outsoles (Fig. 80) found in this room as well, but manufacturing processes indicate that they were not a pair. One of these outsoles had been fastened to the uppers by the MacKay process mentioned above with the aid of a screw machine, and the other outsole exhibited the Goodyear Welt process which was patented in 1875 (Anderson 1968: 61). The other outsoles found in this room and belonging to a pair were also manufactured with the Goodyear Welt process. In this case the soles had been turned before the uppers were sewn in place and the heels were attached with wooden pegs. These two shoes postdate 1875. There were also two insoles and one heel lift from this area and they dated from the same period and probably belonged to the same shoes. The only other significant shoes parts found were in the commissariat stores. These parts were all fragments of one shoe and included the vamp and outsole. The entire shoe was held together with wooden pegs indicating an earlier date than those shoes mentioned above. After 1846, when Elias Howe Jr. patented a sewing machine designed to attach the uppers to the lowers by stitching, the peg method of fastening the uppers to the lowers was rapidly supplanted; thus this shoe was probably manufactured shortly after that date. This may have been the oldest shoe found in the excavation.

As a final statement to this section on artifacts, it would appear that most of the material found within the tower was deposited there during the last part of the 19th century. Most of this material dated from 1860 to 1890 with a few artifacts both earlier and later. This arrangement would be expected, given the active life span of the tower and the personnel concentration which was at its highest during the 1860s. The structural artifacts can be dated with some sort of surety to the early period of the tower, that is, 1847-49, with the exception of the ordinance which was installed in the 1860s. The major importance of these artifacts lies in the information they can convey concerning the structure itself and its periods of activity rather than in presenting a [illegible] presentation of the quality of life of the persons that occupied the tower.

Conclusions

This report has so far dealt with the structural elements of the tower and its physical presence, but nothing has been said concerning its effectiveness and the general effectiveness of the fortifications surrounding Kingston Harbour. Lavell describes them in his article as being highly effective and they may have been at an earlier time against smoothbore cannon and wooden sailing ships. However, by the time they were armed in the 1860s, smoothbore cannon were definitely obsolete and being rapidly replaced by rifled guns, and sails were being replaced by steam. Lavell bases his argument on the fact that while a ship running down the channel to Kingston would have an easy time of it, it would be very difficult for that same ship to tack back up the channel against the prevailing southwesterly wind. He overlooks the fact that this would present little problem to a steam vessel attacking from that direction.

Another factor overlooked by both the builders of the towers and Lavell was the development of rifled guns. In 1846 both an Italian and a German had successfully rifled cannon and in 1855 Lord Armstrong of England developed an iron breech loading rifled cannon whose design was considered revolutionary. At the same time, arms manufacturers in the United States were developing rifled cannon and this development was to be very fast paced with the coming of the war between the States (Manucy 1949: 14). By 1863 the Union Artillery had 100-, 200-, and 300-pounder Parrott rifles which were used to reduce Fort Sumter, South Carolina, to rubble from a distance of two miles. Siege guns of this type set up on Garden Island or the most northerly tip of Wolfe Island could have done the same to the defences around Kingston.

Studies were carried out in England under field trial conditions by the Royal Artillery in 1860 to determine the Martello tower's ability to withstand rifled fire (Burgoyne 1861: 1-9). The guns employed were of the type developed by Armstrong. These trials demonstrated the effectiveness of rifled ordinance at distances far greater than those previously employed by smoothbore cannon. The tower in this instance was reduced to a brick pile after 152 rounds. Another tower besieged under similar conditions but by a smoothbore cannon was deemed a failure.

In conclusion it must be stated that the effectiveness of the tower against the weaponry of the day was nil. Nevertheless, the towers and accompanying fortifications did offer some psychological comfort to the inhabitants of Kingston and they would have probably been effective as a rearguard defence, allowing the inhabitants to escape to the north and Ottawa if the need ever arose.

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